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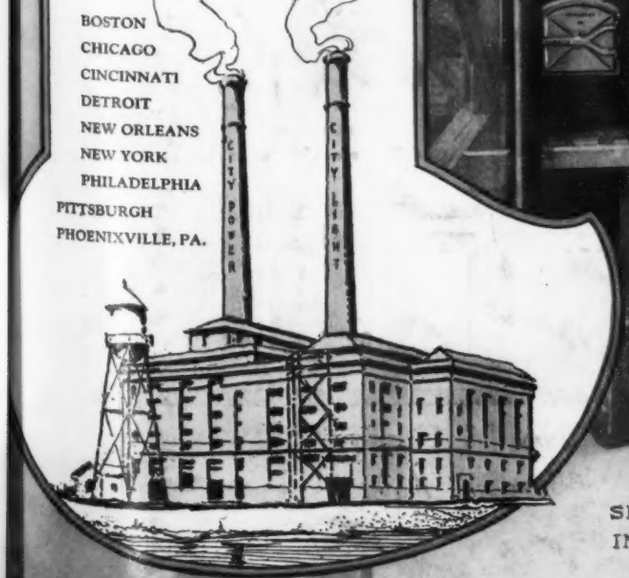

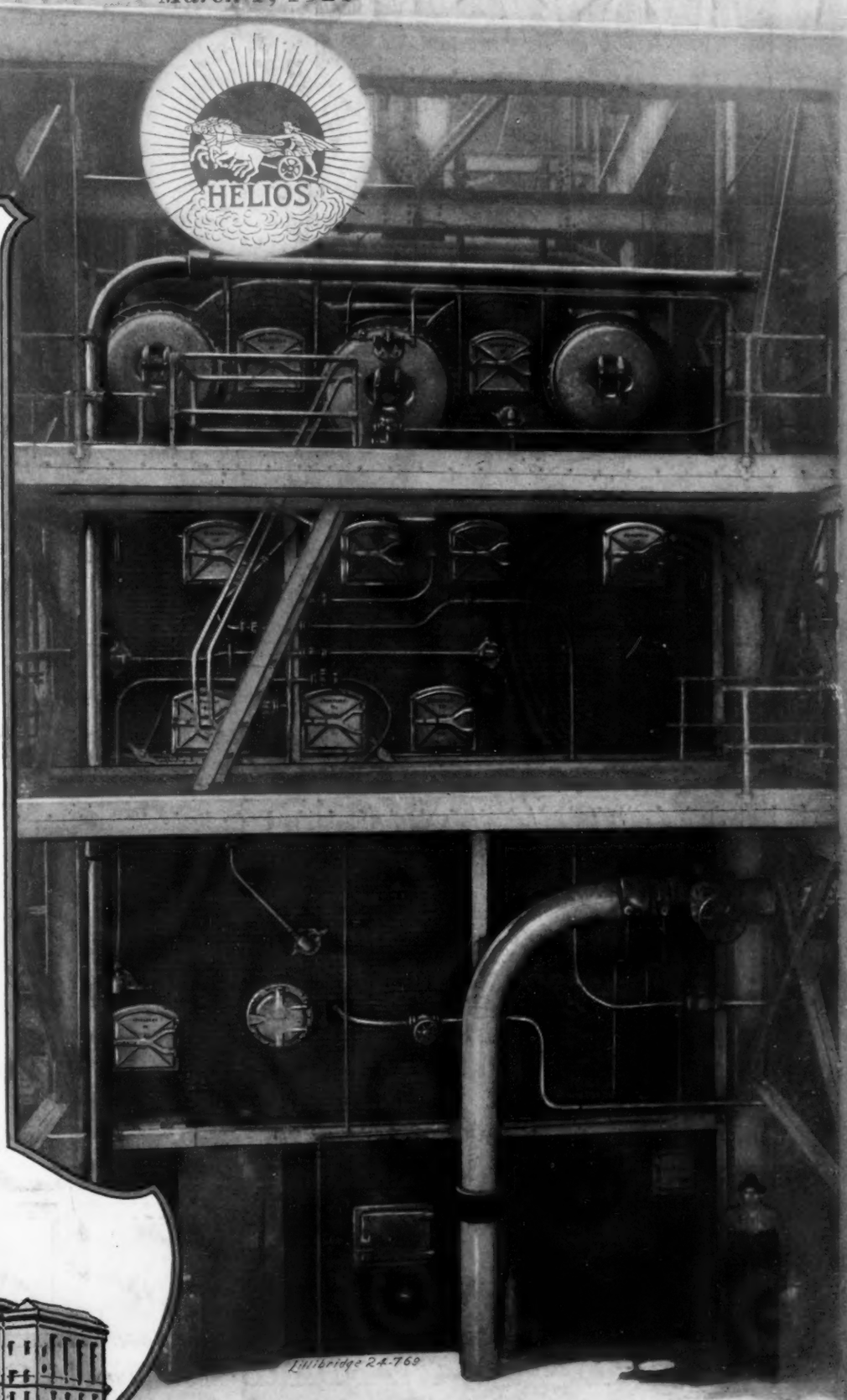

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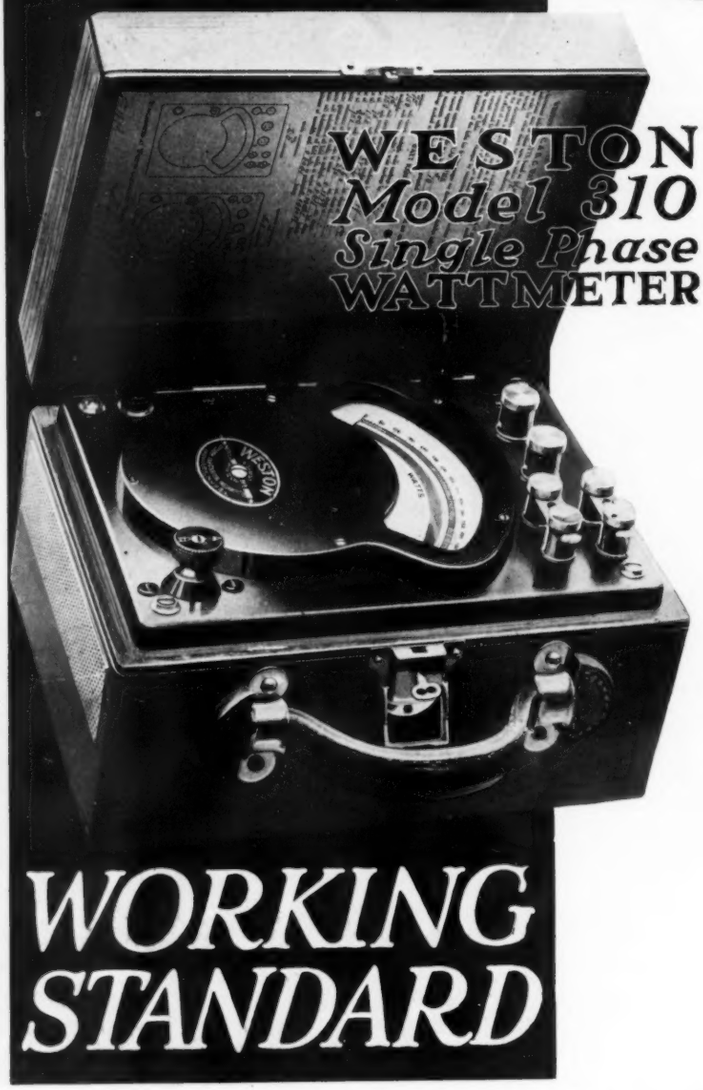

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The Seasoned Veterans of the Industry

ONE of the priceless possessions of the electric light and power industry is the presence of the pioneers to whose vision and initiative the industry as we now know it is largely due. Gathered around these men is a larger group of devoted followers, who have been fired by their zeal and have imbibed somewhat of their inspiration. These men still serve their leaders faithfully and loyally and are a great asset to any company possessing them. A group called the "Gold Button Club" met in Boston last week. Two hundred and four of them make up the legion of honor of the Edison Electric Illuminating Company of Boston, and the president of the company, Charles L. Edgar, is numbered among them.

The members of the club have labored in the public interest, some in humble positions, but all faithfully, for from twenty to forty-five years. That they have served their company equally well is evident from the fact that they are still actively engaged in the business. Other companies can point with pride to similar groups. It speaks well for an industry when men cling to it and serve it for so long a time. Such seasoned veterans are an honor to any company. The community should be proud of them, the state should extol them. As for the industry itself, it recognizes its great debt to them and places them foremost in its esteem and affection. The field of its escutcheon is emblazoned with their devotion to the ideals of service.

The Growth of Interconnection Demands Foresight

JUST where is the central-station industry traveling in transmission-system interconnection? A committee of the Empire State Gas and Electric Association recently made a study of the costs of lines and substations that are in its opinion needed in interconnecting systems of rather large capacity in its territory. Other parts of the United States, particularly in the Middle West, have interconnections of tremendous extent in area and distances covered, but are using only the low transmission voltages. Engineers who have had experience in tying together systems with fairly large capacity sometimes express amazement that it is possible to operate such extensive low-voltage networks. The only reason why many can so operate is that they have no plants of large capacity. On the other hand, some of them are not operating as true interconnected systems—that is, systems tied together and handling the load efficiently under all sorts of conditions.

In a typical case recently noted a moderate-voltage system is connected to several sources of energy of rather high capacity. It operated as an interconnected system for a while, but before its operators realized what was happening it had been split into several sections, each section, in order to obtain satisfactory service conditions, operating independently of the others and from different energy sources. When the operators of the system finally awoke to the fact, they had an expensive problem on their hands, because high-voltage lines had to be constructed to tie the high-capacity sources together as well as to deliver service to the network.

This case is typical of a great many more that are sure to arise as high-capacity plants are developed in territory where there is a large network of low-voltage transmission lines. The real problem lies in the fact that many networks have been developed on the theory that the systems could not stand the cost of high-voltage transmission and distribution. This was perfectly true originally, but there is danger in delayed recognition of the change in conditions and in attempts to tie the sources of energy together by reinforcing the low-voltage transmission with high-voltage trunk lines.

Trunk-line service is desirable, and its cost can often be justified where large amounts of energy must be transferred from point to point. However, in many systems large amounts of energy are not transferred from point to point. The problem of these systems is to distribute the energy and at the same time keep the sources of power operating in parallel. In such cases the transmission lines must serve the double purpose of distributing the energy to the system substations and acting as tie lines between the energy sources, and a solution must be looked for in determining special transmission-network stability limits and choosing a voltage and a conductor which will satisfactorily and economically tie the various plants together and at the same time be practicable for distribution. Trunk transmission plus low-voltage transmission and distribution requires a larger burden of investment than can be supported on many systems and a larger investment than is needed even where it can be supported.

Executives in some sections of the country where low-voltage transmission systems are extensive can well afford to spend a little time looking ahead and planning for the future. A small burden carried now may eliminate a heavy or even an intolerable one a few years hence.

Organizing Transportation Service for Higher Efficiency

FROM haphazard beginnings the transportation service of many central-station companies has developed into a well-organized operating division under considerable executive supervision, and the good work moves forward with more and more regard for economic problems. Internal cost accounting is making headway in the transportation department; better selection of equipment for the varied needs of utilities in different localities is in evidence; the building by operating companies of new general service stations is providing better garaging and maintenance facilities for both passenger cars and trucks, and through good manage-

ment the reduction of wasted mileage, the assignment of rolling stock adapted to the job in hand, the scheduling of routine car movements and a closer control of spare parts and supplies are yielding real profits. This condition is still far from universal, but in well-managed properties serving communities of say 100,000 population upward there is a decided effort manifest toward getting more efficient service out of company motor vehicles.

There is a large field for standardization of practice in the utility transportation department, with due allowance for the play of individual executive judgment. At present "home-made" schemes for transporting meters, transformers, tools, ladders, rope, wire and many other items are very much in evidence. The ordinary commercial motor vehicle appears to need a good deal of modification for this service, and the mechanical "sharps" are never happier than when working on such adaptations. Ingenuity finds ample scope for exercise here, but as the fundamental requirements of central-station transportation come into sharper focus it would seem as if motor-vehicle makers and utility men working together might establish certain types of designs better suited to all-around service than the present equipment modifications.

Much progress has been made of late in providing for the comparatively shockless transport of meters and instruments; the relation of convenience of access for smaller tools and supplies to time spent on field work is stimulating better arrangements, and the study of open-top as opposed to closed-top equipment in relation to speed of operations in the field is proving suggestive. It is being shown in some companies that lowest first cost in a motor vehicle does not necessarily mean lowest operating cost. More analytical study of the fitness of units about to be purchased is desirable. This branch of the work of the modern central-station company is in a transition stage, but it is encouraging to see so much interest taken in matters formerly overlooked or else regarded as outside the pale of standardization.

A Yardstick to Measure the Appliance Business

THOSE who have been following the ELECTRICAL WORLD'S series of articles on "Who Sells Electrical Appliances?" the fifth of which appears in this issue, may fairly ask how nearly the tabulation of sales by different classes of dealers represents the total sales in a given city. Obviously it would have been impracticable, if not impossible, to make an absolute inventory of all electrical goods sold by all the merchants in a locality. But in no case has the omission of the sales by some retailers been of sufficient importance materially to lower the total or distort the proportion of sales. Where only one or two dealers under any classification appear in the tabulation it is because they are the only ones of that particular class who cut any figure in the total; and lest the department store and central-station business overbalance the total, care has been taken that their sales represent the true proportions of the whole.

This investigation was started primarily to learn the relative importance of various retail outlets, both electrical and non-electrical; to see how the volume of sales was trending, and to uncover, if possible, the reasons for certain weaknesses which have appeared peculiar to the merchandising of household devices. It was also hoped that it would show what part the central station plays, not only as a direct merchant but also as an influence in the community, in the appliance field. It is intended that the survey will provide a yardstick by which the appliance business under given typical conditions may be measured and that it may indicate what certain definite effects may be expected under such conditions.

Modern Automatic Control as a System

AN IMPORTANT but rather inconspicuous influence in the evolution of electricity to its present almost universal adaptability for industrial and social purposes is the ease and accuracy with which it can be controlled. Control is the co-ordinating and potent common factor in production, transmission, distribution and utilization, since it enables engineers to subject electrical energy to human needs in an automatic and predetermined sequence and degree.

Yet modern electrical control systems are somewhat vaguely appreciated and understood by the rank and file of electrical engineers because they have developed as a specialty so very rapidly and recently. Too frequently engineers consider control a necessary evil whose visual appearance resembles a switchboard composed of a multitude of clattering and troublesome "contraptions." To this type of engineer a controller is a face-plate rheostat or a drum controller similar to that found on street cars, and a push-button controller is a small box containing one or more buttons connected to mysterious and complicated apparatus which operates a motor. Very often engineers study carefully the production or process requirements for a given application before purchasing the necessary motors or other apparatus and then order the control equipment blindly or on the basis of an offhand recommendation from a salesman or brother practitioner.

It cannot be urged too strongly that modern automatic control engineering is a specialty which has been developed on a system rather than on an apparatus basis. The selection of the control for paper mills, elevators, furnaces, machine tools and virtually all other commercial applications of electricity involves a knowledge and a responsibility equal to that required for any other aspect of engineering because in the control lies the automatic and mechanistic intelligence that makes or mars the job. To insure an adequate control system for any application it is necessary to study the particular process or duty cycle, the working conditions with respect to moisture, fire hazards, safety and grade of labor, the sequence of production operations and their relative speeds, and the power requirements on an instantaneous and average basis. Following studies of this character a system involving control apparatus must be selected whose invisible workings will cause all apparatus to operate in an automatic and predetermined manner. Much experience combined with liking and instinct for the task is the qualification for success in this little known and less appreciated branch of engineering.

Thus the intelligent utilization of control apparatus for any application of electricity requires analytical studies based on a knowledge of the capabilities and limitations of the separate control devices that are available for commercial use. Control applications

must be considered from a system viewpoint if results are to be obtained which an intelligent study shows to be possible. Most of the unsatisfactory commercial applications of electricity to individual jobs can be traced to an ill-considered selection and hit-or-miss assembly of control apparatus. On the other hand, the success of electricity in modern civilization can be attributed to the marvelous and efficient control systems. There seem to be no inherent limitations to the development of control adequate to accomplish any predetermined action or series of actions, and the recent rapid invasion of many new branches of industry by electricity can be recorded as representing largely the achievements of skilled and ingenious control engineers.

Waging the Battle of the Steam Cycles

A SERIES of steam cycles for practical engineering consideration has burst explosively among engineers having knowledge of and accustomed to the use of only the Rankine cycle with its adiabatic expansion.

This action has followed the very radical thermal conceptions now being incorporated in steam engineering practice, and there has been created a great interest in thermodynamic studies hitherto considered only theoretical. In spite of recent notable papers on the subject, there is still a lack of definite information and data in regard to the actual commercial operation of the proposed cycles, and data on the constants of steam at the pressures and temperatures considered are inaccurate and meager. But very active and diligent researches are now being conducted to determine the actual possibilities of the proposed schemes. These researches involve a study of steam, of boilers, of turbines, of condensers, of feed heaters, and of other equipment associated with steam production, because the theoretical thermal possibilities must be considered in conjunction with the mechanical efficiencies of the equipment used.

So many cycles or thermal combinations have been proposed that a very great task confronts the engineers working on these problems. The ordinary Rankine cycle must be studied and extended to include the use of higher pressures. The Ferranti or reheating cycle is going into actual use, and to its theoretical slight advantage over the Rankine cycle must be added the gains due to reduced losses in the turbines. Another cycle to be studied is the regenerative cycle, which uses stage bleeding for heating the condensate, and this cycle also is being used as a practical operating system. Another notable thermal combination recently introduced involves the use of both regeneration and reheating. Still more speculative and interesting thermal cycles are those incorporating constant temperature expansion and regeneration within the turbine and the use of steam generation above the critical pressure in combination with some of the other cycles.

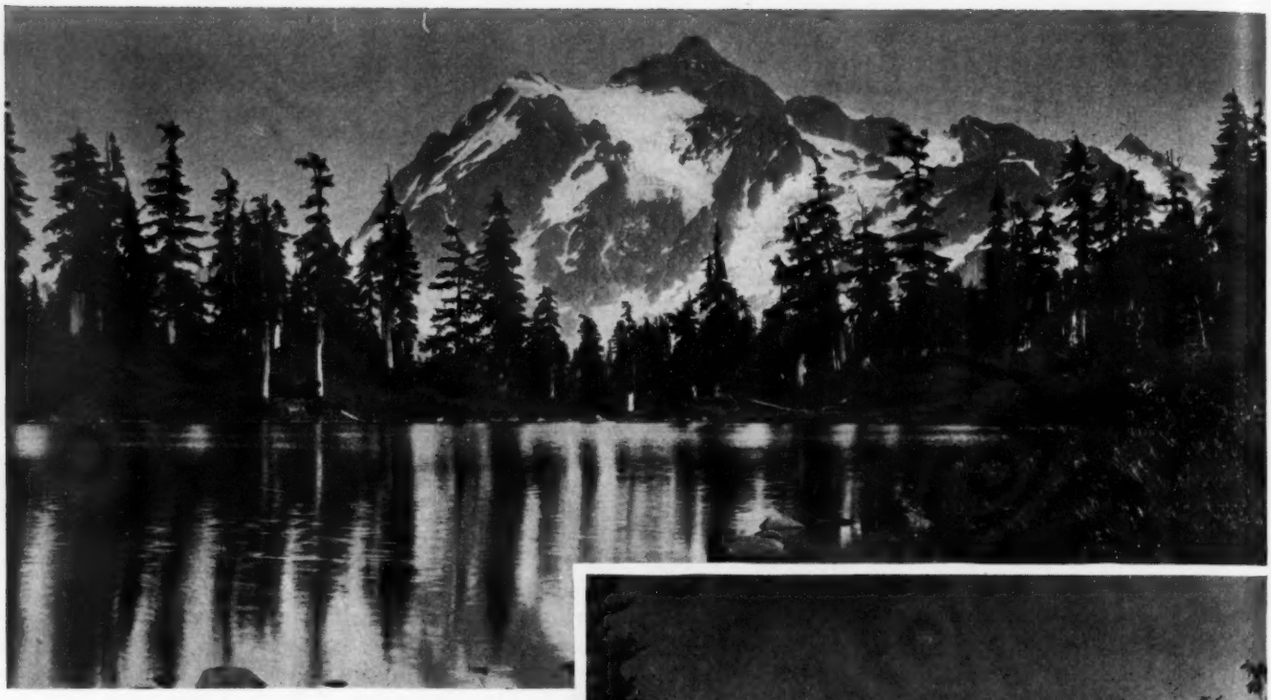
With all these new thermal arrangements being investigated, an accurate knowledge of their relative operating merits should be obtained in the near future. It is encouraging to note that all seem to offer opportunity for increased economy in bulk production of electrical energy. Naturally, reliability and convenience in operation are fundamental considerations in energy production, and it is very probable that conditions of production in each particular locality will prevent adoption of identical thermal schemes for all stations.

Important New Data on Silicon Steels

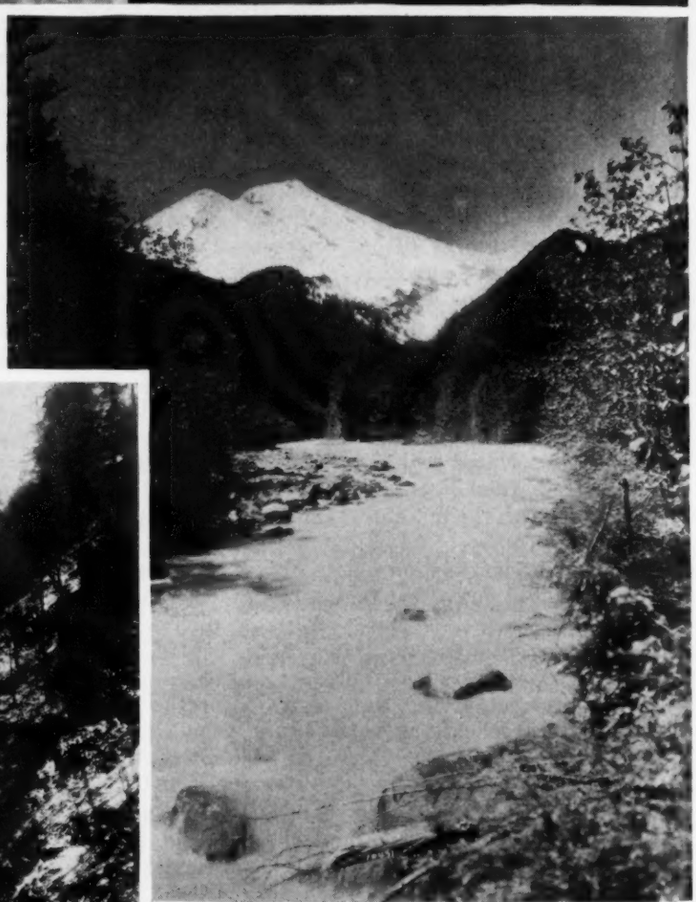
FOR some time past the electrical industry and profession have been aware that notable improvements were being realized in the properties of magnetic materials. The most conspicuous case has been the production of the so-called silicon steels, in which values of permeability have been increased and losses decreased, both in very notable degree. It has been difficult, however, to obtain exact information as to the methods in which these improvements have been realized, and also as to the degrees in which the magnetic properties are improved as related to the chemical compositions of the new compounds.

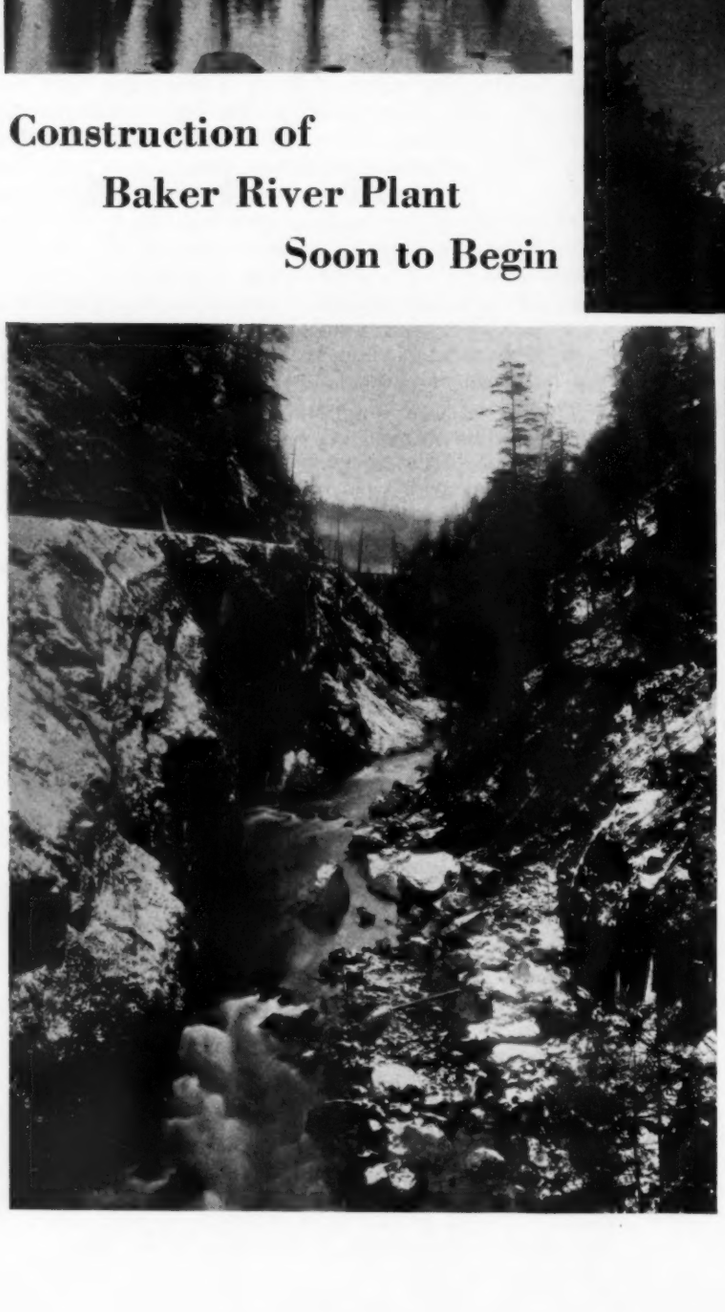
The problem of the exact nature of the magnetic performance of iron and its less conspicuous magnetic neighbors has long been one of the most baffling confronting the physicists. Theories of magnetism have been proposed from time to time, but, doubtless owing to the difficulties attending both experiment and its analysis, none of these theories has been able to go very far in accounting for the varied facts of observation. Perhaps this explains the small number of investigators heretofore attracted by this problem. In this country the name of T. D. Yensen has been conspicuous as an investigator of marked persistence and ability in this field. His early work on magnetic alloys immediately attracted attention, but it is certain that one of his most important contributions will be found in the results of his work of recent years, as described in a paper on "Magnetic Properties of the Various Compounds of Iron, Silicon and Carbon" presented at the midwinter convention of the A. I. E. E. at Philadelphia. This paper contains an extensive and most satisfying accumulation of data explaining completely the influence of carbon as the troublesome ingredient of magnetic iron and dealing with the corrective properties of silicon. Moreover, the results are correlated with studies of the microstructure of the finished material in a way which permits the use of this method as a valuable indication of the properties to be expected.

The paper must be consulted for the numerical degree in which the several improvements in magnetic properties may be reached. Equally important with the improvement in magnetic properties, however, is the further knowledge obtained by Mr. Yensen as to the explanation of several factors governing the magnetic behavior of iron. In this direction he has obtained results of pure scientific value which may well prove a stepping stone to a more complete understanding of the ultimate nature of magnetic phenomena. He has shown the significance of the several types of combination of carbon with iron. In extremely minute quantities, when it is in a sense in solution with iron, it has a marked effect in increasing the hysteresis loss, and in these small proportions it is difficult to eliminate. In larger proportions it combines with iron into various chemical compounds and mixtures, and it is in these regions that the results of the new work are of especial importance. The addition of the silicon in proper proportions appears to facilitate the conversion of carbon into graphite, and in this form it has a greatly lessened influence on the magnetic properties. It should be noted also that in Mr. Yensen's work, which has undoubtedly entailed the expenditure of much money, we have another example of the foresight of a large manufacturing company in supporting pure research and earning its reward in results of great value.



Construction of Baker River Plant Soon to Begin





ON THE site where these photographs were taken—the Baker River Valley, in Skagit County, Washington—the Puget Sound Power & Light Company of Seattle is soon, as already announced in the ELECTRICAL WORLD, to begin the construction of a 45,000-hp. hydro-electric plant which will ultimately represent an investment of $6,000,000. The foundations and approximately 50 ft. of the dam are scheduled for completion in 1924, and the entire structure will be built and 30,000 hp. in generating equipment ready by the end of 1925. A tunnel 1,200 ft. long will carry the water to the power house below the dam.

This project is looked upon as one of the most interesting of its kind in the Northwest. The Baker River insures a steady and dependable flow of water. Falling out of Baker Lake, it passes through Sulphur Canyon, where a potential development may be carried out after the completion of the present installation at Eden Canyon, 12 miles below. Here the concrete dam will be 235 ft. in height from the solid rock at the bottom of the canyon to the upper edge. Many interesting engineering problems are associated with this development.

Open-Delta Transformer Operation

Advantages and Disadvantages of This Connection from Operating and Commercial Standpoints—Method for Computing Regulation and Capacity—Correction for Voltage Unbalances

By A. BOYAJIAN
General Electric Company, Pittsfield, Mass.

THE possibility of operating two transformers in open delta is rather well known, and this connection is frequently used as an emergency measure. A discussion of the advantages and disadvantages of this connection and of a possible means of correcting certain limitations might bring about its more intelligent use, for it appears that it is sometimes employed under circumstances where it should not be used and in other cases is neglected where it could be utilized to good advantage.

ADVANTAGES OF OPEN-DELTA OPERATION

Some of the advantages of this style of operation are:

1. When one unit of a three-phase delta-connected bank fails, it is an advantage to be able to run the remaining two units in open delta and maintain service even at a reduced capacity, instead of shutting down the entire bank. This advantage is possible only with delta-delta connection, except, perhaps, in rare cases in solidly grounded Y-delta systems or four-wire systems.

2. As a permanent installation a two-unit set of a given capacity is cheaper than a three-unit set of the same capacity.

3. In instances where an operator has two transformers in stock which can handle the load it would be natural to consider open-delta operation as against buying another unit to make the bank closed delta.

4. Occasionally, in a locality with an expected ultimate load considerably larger than the existing load, it is more economical to install two units in open delta and later, when the load demands it, to add a third unit to the bank, closing the delta. Besides the smaller initial investment, the two-unit set will also have the advantage of involving only two-thirds of the core loss of the complete three-unit set.

DISADVANTAGES OF OPEN-DELTA OPERATION

These advantages of open-delta connection are not in practice so great as one might be led to believe from their tabulation, especially in view of the following disadvantages:

1. It is commonly known that transformers in open-delta connection operate with an 86 per cent internal power factor, assuming the load power factor to be 100 per cent. As a result of this, two transformers in open-delta can furnish a load of only 58 per cent of that of three units in closed delta; that is, only 58 per cent of the load of a complete bank. Thus as an emergency measure only about half the rated load of the original bank can be carried, and, therefore, even though the scheme may not be quite so bad as complete shutdown, it will be bad enough. The importance of continuity of service for the rated load, therefore, may make this disadvantage great enough to throw out the connection and require the maintenance of spares.

2. In considering advantage listed as No. 4, it must be remembered that the two-unit bank at full-load will have twice the copper loss of the complete three-unit bank, offsetting partially or totally the advantage in core loss. Whether there will be a net advantage or disadvantage when the twenty-four-hour losses are considered depends on the ratio of core loss to copper loss and on the load factor. For instance, assuming the rated full-load copper loss as twice the core loss, and assuming that the mean effective load is equivalent to six hours' full load per day, the two-unit set is more efficient, the twenty-four-hour losses being in the ratio of six to seven.

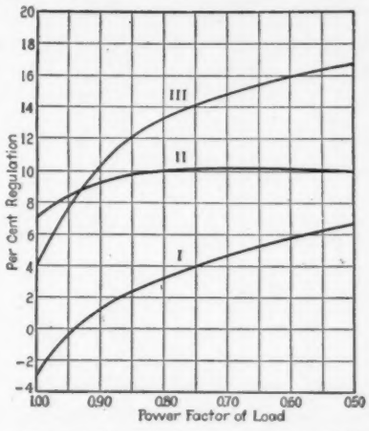


Fig. 1—Regulation of an open-delta bank with 10 per cent reactance and 2 per cent resistance and load 86 per cent of total single-phase rating.

3. The regulation of an open-delta bank is unsymmetrical, and, where the reactances of the units are comparatively high, the unbalancing of the secondary voltages may become a serious matter.

For illustration, assume 2 per cent resistance, 10 per cent reactance and 70 per cent power factor of load. The regulations of the three phases may be calculated by the following approximate formulas:

Percentage of Regulation Equals

Phase I: P.F.$(0.86\,IR - 0.50\,IX)$ + R.F.$(0.86\,IX + 0.50\,IR)$

Phase II: P.F.$(0.86\,IR + 0.50\,IX)$ + R.F.$(0.86\,IX - 0.50\,IR)$

Phase III: P.F.$(1.73\,IR)$ + R.F.$(1.73IX)$

Phase III is the open phase. The drops IR and IX are expressed as in per cent.

P.F. stands for power factor of load and R.F. for its reactive factor.

The reactances and resistances are per phase or per unit at its rated single-phase load. The balanced three-phase load for which the above regulations are figured equals 86 per cent of the rated kva. of the two units, which is their limiting output in open-delta connection.

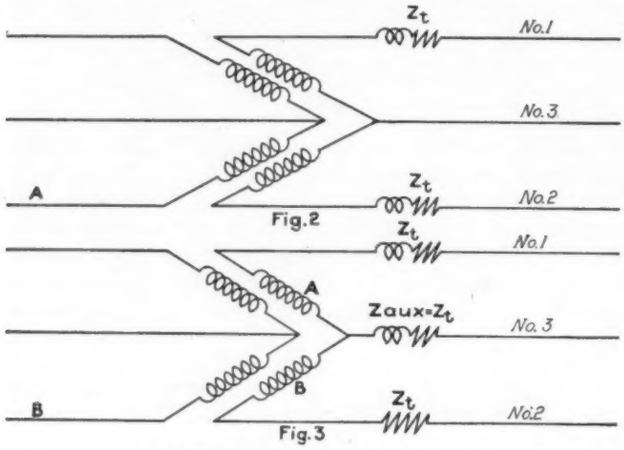
Substituting the assumed values of resistance, reactance and power factor in these formulas, we have:

Regulation across Phase I = 4.6 per cent.
Regulation across Phase II = 10.2 per cent.
Regulation across Phase III = 14.7 per cent.

Fig. 1 shows how these regulations vary with power factor.

If the delta is closed, the regulation, at a load 1.73 times the preceding load, will be 8.5 per cent in all phases. Evidently, when the reactance is not very low (not less than 5 per cent) the unbalancing of phase voltages due to open-delta operation may become objectionable. This difficulty, however, can be rectified as follows:

The internal impedance of two units in open-delta connection may be shown by two external equivalents, as in



CORRECTING INTERNAL UNBALANCE OF OPEN-DELTA CONNECTED TRANSFORMERS

Fig. 2—The internal impedances of two transformers in an open-delta bank are shown to be dissymmetrical.

Fig. 3—Balancing the impedances of an open-delta bank by using an external auxiliary impedance.

Fig. 2. Here there is an impedance Z_t (meaning transformer impedance) in series with line No. 1 and a similar impedance in series with line No. 2, but nothing in series with line No. 3. Evidently, with a symmetrical load and an unsymmetrical bank of impedances the voltages will be rendered unsymmetrical. If, however, there should be introduced an external auxiliary impedance, Z_{aux}, equal to the transformer impedance Z_t, in series with line No. 3, as shown in Fig. 3, the impedance of the bank will be perfectly symmetrical and therefore the regulation and voltages of the various phases will be perfectly symmetrical, regardless of the magnitude and power factor of the load and regardless of the unsymmetrical connection of the transformer windings.

The cost of a balancer may be estimated when it is borne in mind that its kva. rating in per cent of the total output of the bank will be one-third the per cent impedance which it introduces into the line. Thus, the kva. capacity of a balancer which introduces 6 per cent reactance will be 2 per cent of the total kva. output of the bank. Since a reactor has only one winding, its equivalent transformer rating is only one-half its reactor load.

Balancers for two other common unsymmetrical transformer connections (both of which are liable to voltage unbalance under symmetrical loads) are shown in Figs. 4 and 5, the former for the T-T connection (which will be further discussed), and the latter for the two-phase-three-phase connection.

4. Aside from unsymmetrical regulation, which can be rectified as described above, open-delta operation suffers from poor regulation even in moderate reactance transformers. The reason for this is as follows:

Considering the balanced-impedance open delta, it will be evident that the impedances are as though three similar transformers were connected in Y, whereas the system voltages are as though the transformers were connected in delta. This makes the effective impedance of the system 73 per cent higher than the normal rated single-phase reactance of each unit. Translated into concrete figures, this means that, if two similar transformers having 7 per cent reactance (as single-phase units) are connected in open delta and balanced by an auxiliary impedance, they will have a regulation corresponding to 7×1.73—that is, 12 per cent—impedance transformers delivering a load only 86 per cent of their rated kva. The regulation of such transformers in a closed-delta bank for a 70 per cent power-factor load will be 5 per cent, whereas in balanced open-delta connection it will be about 9 per cent.

It is to be observed that the balancing impedance is good only for balancing and accomplishes this by increasing the regulation on the phase where it is low. Its great advantage lies in the fact that, while it is extremely difficult and expensive to correct badly unbalanced voltages by means of either induction regulators or auto-transformers, yet when the line voltages are balanced with such an auxiliary impedance, then the voltage-regulating devices of the system, such as induction regulators, auto-transformers, transformer taps, etc., may be conveniently utilized to boost the load voltage to any desired value.

In view of these considerations, whenever there is a strong reason to use open-delta connection, unbalancing of line voltages should be calculated and, if objectionable, should be corrected by a balancing impedance, the voltage regulation, if poor, being corrected by means of an induction regulator, an auto-transformer, or by taps in the step-up or step-down transformers, according to which means is available.

5. In paragraph No. 2 under the discussion of advantages it was stated that two units of a given total capacity are cheaper than three units of the same total

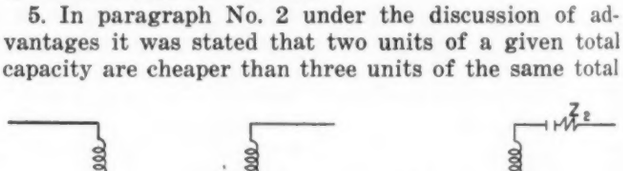


FIG. 4—T-T CONNECTION WITH AUXILIARY BALANCING IMPEDANCES z_1 OR z_2 WHERE z_1 EQUALS ONE-HALF OF THE TRANSFORMER IMPEDANCE; z_2 IS THE SAME MAGNITUDE BUT IS CONDENSIVE

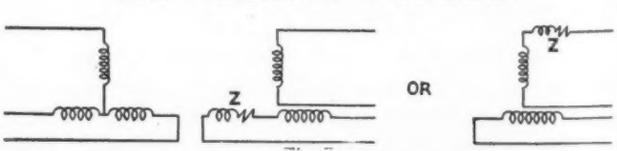
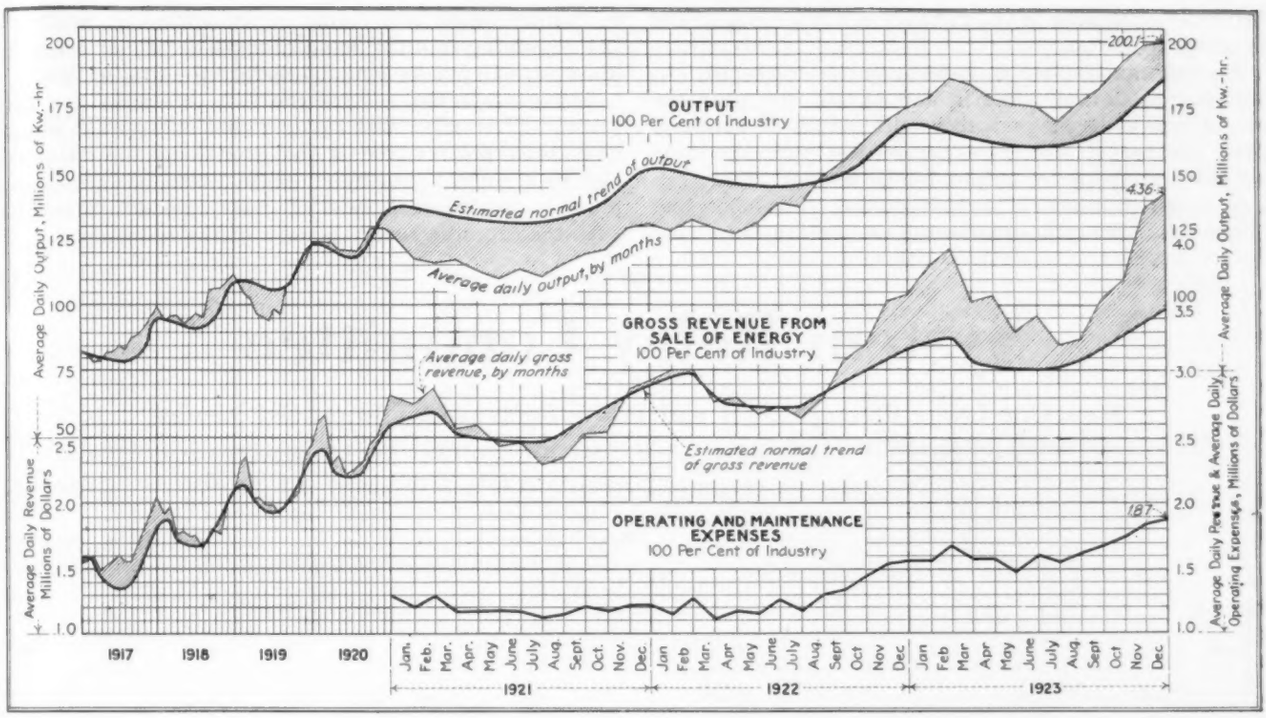


FIG. 5 — T CONNECTION WITH BALANCING IMPEDANCE, IN EITHER THE MAIN OR TEASER UNIT IN ORDER TO EQUALIZE PHASE IMPEDANCES

capacity. This advantage is offset by the fact that two units in open-delta connection can deliver only 86 per cent of their rated kva., and hence to deliver the same 100 per cent kva. as a three-unit set the two-unit set must have a capacity of 115 per cent. It is, then, necessary to compare the cost of two 57.7 per cent kva. units against three 33.3 per cent kva. units. A careful comparison shows that the open-delta bank costs only a trifle less, the difference in most cases being quite negligible. In the matter of total losses the advantage is slightly in favor of a three-unit closed-delta bank.



Record Operations During December

IN SPITE of the fact that December witnessed a material curtailment in the energy requirements of a large portion of the industrial plants of the country, the average daily electrical energy output for the country as a whole reached record proportions. Reports for the month of December received by the ELECTRICAL WORLD from electric generating and distributing companies representing 70 per cent of the installed generator rating of the country indicated that the average daily output was 200,103,000 kw.-hr., or 1,553,000 kw.-hr. above the November returns. The fact that the daily output was in excess of the November figures is undoubtedly due to the seasonal increase in lighting requirements, which more than overcame the increase in industrial requirements. The total output for the month of December, however, far exceeded any previous output, with 6,200,000,000 kw.-hr. This is the first time that the central-station output has exceeded 6,000,000,000 kw.-hr. during any one month.

The revenue from sale of energy also reached record proportions, with a total of 135,200,000, or an average daily revenue of $4,358,000.

A study of the accompanying diagram indicates that the central-station output during December was about 8 per cent above what it would have been if the energy requirements of the industry had been normal. The "normal trend of output" curve has been adjusted slightly to accord with the expected growth of the in-

TABLE I—CENTRAL-STATION RETURNS FOR THREE MONTHS

Mos.	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1923 Thousands	1922 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1923 Thousands	1922 Thousands	Per Cent Increase
Oct....	74	4,416,272	3,802,735	16.1	68	$77,906	$68,979	13.0
Nov....	72	4,288,735	3,832,595	11.9	66	83,915	74,768	12.2
Dec...	70	4,342,267	3,965,976	9.5	64	86,522	77,651	11.4

Mos.	Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies Reporting) 1923 Thousands of Dollars	1922 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1923	Steam Plants 1922	Hydro Plants 1923	Hydro Plants 1922	Combined Systems of Steam and Hydro 1923	Combined Systems of Steam and Hydro 1922
Oct....	58	31,449	28,515	10.3	49.0	52.1	28.0	28.9	54.8	48.8
Nov....	56	31,040	28,424	9.2	48.2	50.4	27.3	24.3	48.6	46.0
Dec...	55	31,908	30,285	5.4	48.1	49.4	26.0	28.1	43.8	47.8

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A THREE-MONTH PERIOD

Month	Percentage of Installed Ratings Represented	New England States 1923 Thousands	1922 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Atlantic States 1923 Thousands	1922 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	North Central States 1923 Thousands	1922 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	South Central States 1923 Thousands	1922 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Pacific and Mountain States 1923 Thousands	1922 Thousands	Per Cent Increase
KW-HR. OUTPUT:																				
Oct.....	72	347,889	296,896	17.1	73	1,619,161	1,401,896	15.5	71	1,393,397	1,200,285	16.0	55	243,529	193,851	25.6	90	812,296	709,807	14.5
Nov.....	71	327,704	310,788	5.4	71	1,611,582	1,427,254	12.9	69	1,352,903	1,216,602	11.2	54	231,246	206,921	11.8	87	765,300	667,764	14.1
Dec.....	68	319,424	334,497	-4.5	70	1,645,858	1,488,868	10.5	68	1,368,696	1,257,540	8.9	53	228,404	197,694	15.5	83	779,885	687,377	13.5
REVENUE:																				
Oct.....	72	$8,001	$7,107	12.5	68	$29,573	$26,343	12.3	61	$22,881	$20,091	13.9	55	$5,320	$4,584	16.1	90	$12,131	$10,854	11.7
Nov.....	71	8,389	7,841	7.9	65	33,275	29,546	12.7	59	24,106	21,371	12.8	54	5,601	4,749	18.0	87	12,544	11,261	11.4
Dec.....	68	8,497	8,471	0.3	64	34,523	30,552	13.0	58	24,765	22,231	11.4	52	5,684	4,875	16.5	84	13,053	11,522	13.3
OPERATING EXPENSES:																				
Oct.....	44	$2,705	$2,329	16.2	55	$11,648	$10,245	13.7	51	$10,111	$9,762	3.6	54	$2,630	$2,308	14.0	88	$4,355	$3,871	12.5
Nov.....	43	2,349	2,439	-3.7	53	11,558	10,178	13.6	49	10,132	9,453	7.2	53	2,605	2,398	8.6	85	4,396	3,956	11.1
Dec.....	42	2,275	2,687	-15.4	53	11,950	10,734	11.3	49	10,175	9,823	3.6	52	2,553	2,466	3.5	82	4,955	4,575	8.3

dustry as estimated in the January 5, 1924, issue of the ELECTRICAL WORLD.

A significant fact to be ascertained from the December returns is that while in January of last year the output was 28.6 per cent above the output of January, 1922, the output for December of last year was only 9.5 per cent above the output for December, 1922. The unexpected decrease in output during November and December under that predicated on seasonal increases in former years will result in the estimates made at the beginning of 1924 being decreased. Final returns, however, will not be available before the first of May.

The gross revenue from the sale of energy for the month of December was 25.5 per cent above what would have been the revenue if the growth of the industry had been normal. A slight readjustment has also been made in the "normal trend of gross revenue" to accord with the expected future growth of the industry.

System Relay Committee

How One Large Electric Light and Power System Has Improved Service Reliability by Forming a Co-ordinating Committee to Study Troubles—Details of Work and Organization

By M. T. CRAWFORD

Superintendent of Distribution Puget Sound Power & Light Company, Seattle, Wash.

FOLLOWING a case of trouble on the transmission system of the Puget Sound Power & Light Company a number of years ago, a standing relay committee was appointed by the manager, D. C. Barnes, to study system operation and plan schemes of relay protection. This committee consists of S. C. Lindsay, J. Harisberger and M. T. Crawford, heads of the engineering, power and distribution departments respectively. Meetings are held from once to three or four times per month as conditions require. The proceedings of each meeting are recorded and a copy is sent to the manager. One or more assistants are frequently invited from each department to participate in the consideration of special subjects coming under their jurisdiction, for example an assistant engineer or the chief draftsman from the engineering department, the superintendent of transformation or a power-plant superintendent from the power department and the chief load dispatcher or the distribution engineer from the distribution department.

The first work of this committee was entirely in connection with the relay equipment on transmission lines. It was soon found, however, that the accomplishment of operating reliability included a more comprehensive

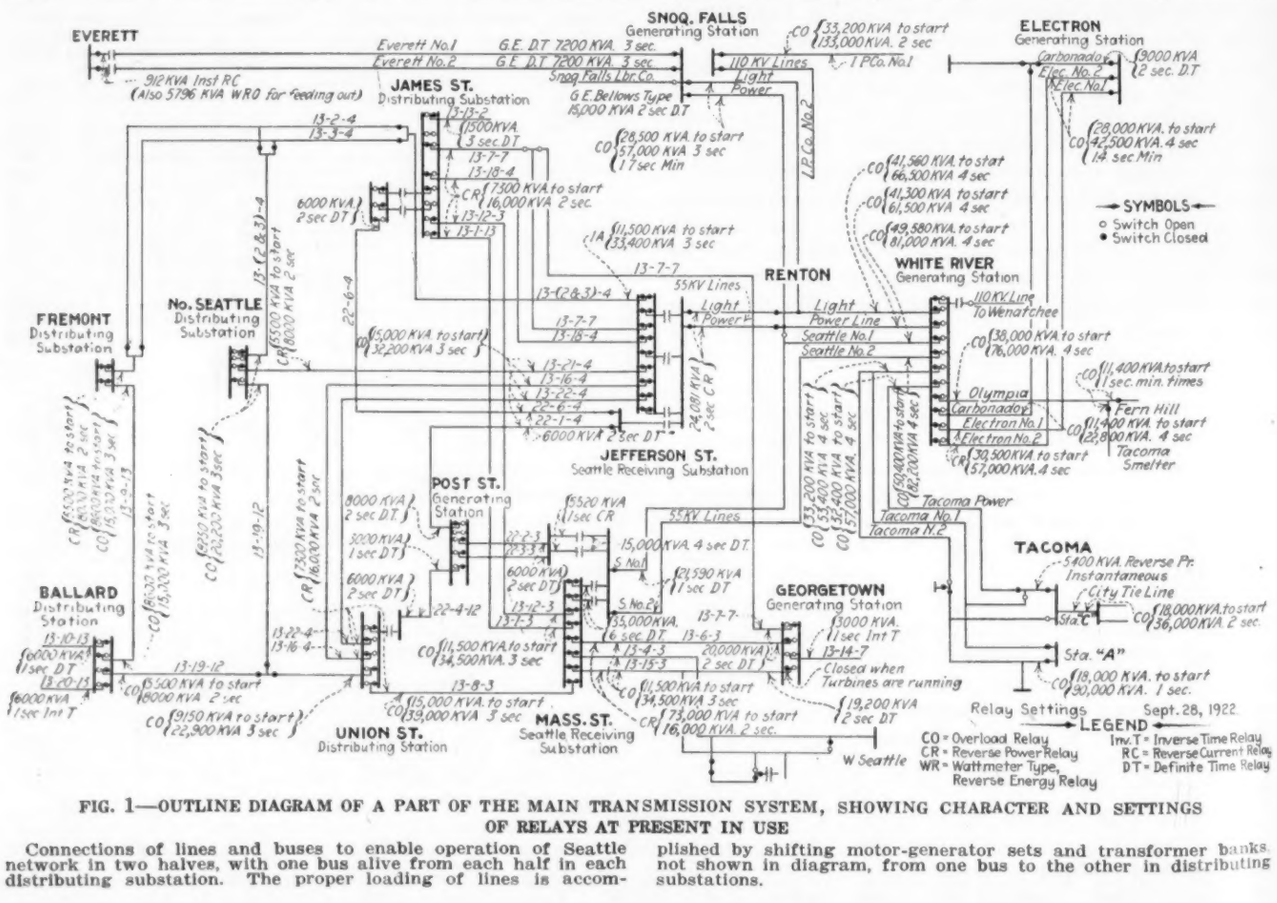


FIG. 1—OUTLINE DIAGRAM OF A PART OF THE MAIN TRANSMISSION SYSTEM, SHOWING CHARACTER AND SETTINGS OF RELAYS AT PRESENT IN USE

Connections of lines and buses to enable operation of Seattle network in two halves, with one bus alive from each half in each distributing substation. The proper loading of lines is accomplished by shifting motor-generator sets and transformer banks, not shown in diagram, from one bus to the other in distributing substations.

field, covering protection of electrical apparatus and generators, calculation of short-circuit currents and rupturing capacity of circuit breakers and the engineering features of new construction. The committee was found to offer an efficient means for co-ordinating the efforts of the departments to obtain the maximum operating reliability, and the manager now asks this committee to make formal recommendations on many problems of engineering policy on new construction where the system as a whole is affected.

System Trouble Starts Committee Action

The functioning of this committee is automatically set in motion by a case of system trouble. The monthly report of the chief load dispatcher contains a log of the system operation, giving the details of all important line or equipment outages, with sequence of circuit-breaker operation and effect on the service. Copies of this report go to each member of the committee, and when there is a case of trouble in which the relays do not function properly to clear without affecting service, the committee meets to consider it and plan improvements to prevent a repetition. When new lines or apparatus with relay protection are ready to put in service, the committee also approves the proper relay equipment and setting. The engineer usually has the short-circuit currents already computed and other data worked out so that the action of the committee is frequently merely to confirm the engineers' recommendations from the operating point of view.

In serious cases of trouble the committee functions a good deal like a grand jury. For instance, one case of trouble last year started in a manhole fire, and when relays failed to clear, substation equipment was damaged and burning oil involved other apparatus. Although the extent of the damage was largely due to this portion of the system being under construction and incomplete, a number of important consumers were seriously inconvenienced and the manager called on the committee for an exhaustive report. Direct testimony was taken from cable splicers, station operators, load dispatchers and all concerned. Damaged equipment was photographed and reports were obtained on apparatus failures. The distribution engineers reproduced the circuit conditions and took oscillograms on the cable system when rupturing artificial short circuits. The company's chief electrical engineer was consulted, and conferences were had with manufacturers' engineers. The committee then submitted a full report with all testimony data and exhibits assembled therein, together with a number of specific recommendations. Although these involved an expenditure of several hundred thousand dollars, they all received executive approval and were under way as soon as practicable.

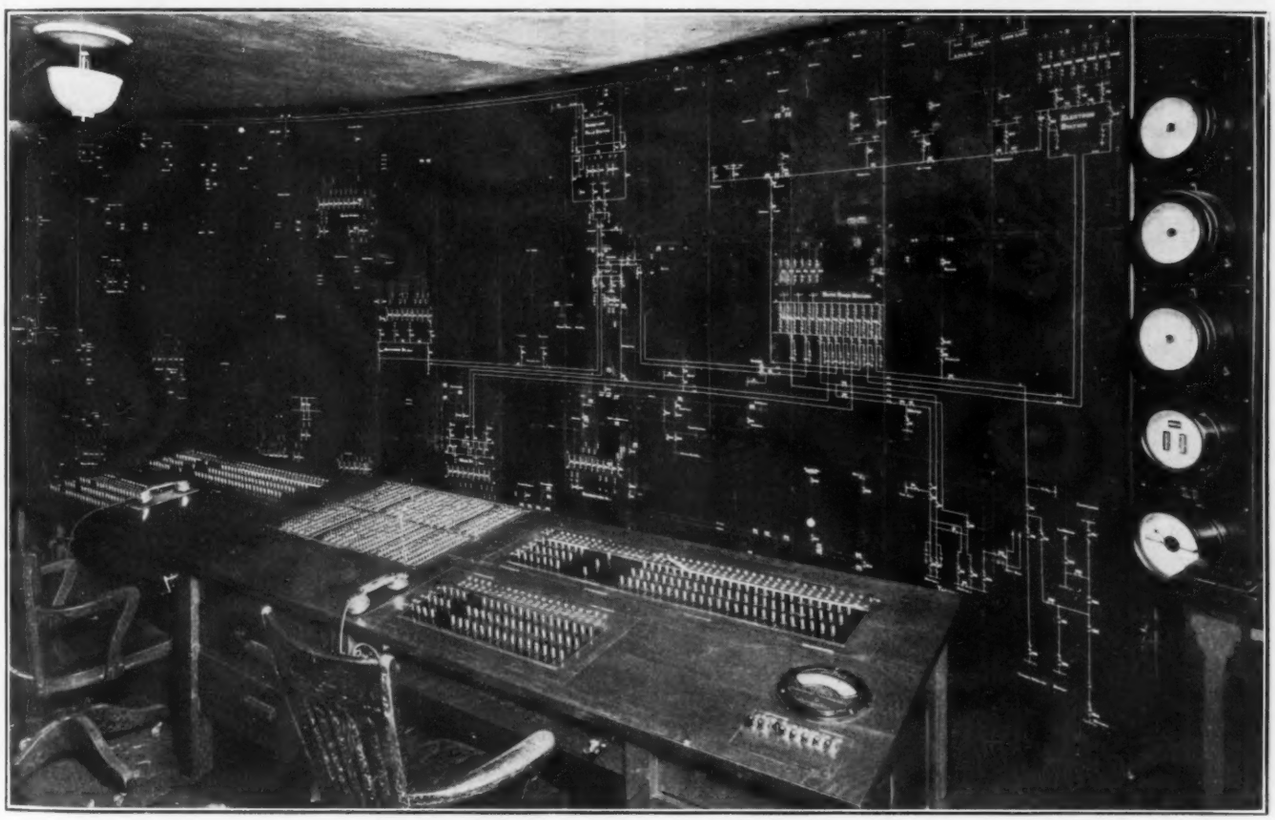


FIG. 2—LOAD DISPATCHER'S ELECTRICALLY ILLUMINATED REMOTE-CONTROLLED DIAGRAM BOARD AND TWO-POSITION CORDLESS TELEPHONE OPERATING BOARD

Keys for controlling red and green switch lights on diagram board are shown in center position on telephone board.

Relays Considered on Group Basis

To a certain extent group consideration may be given relay problems on interconnected systems. For instance, about 650 circuit miles of 110-kv., 55-kv. and 13-kv. transmission lines between main generating stations and principal distributing substations on the Puget Sound network form a distinct problem. Additional 110-kv. lines interconnect the Puget Sound network with other similar networks of lines and stations in other sections of the state, such as the lines and generating stations of the Washington Water Power Company in eastern Washington, the Pacific Power & Light Company in the southeast portion of the

state and the Chicago, Milwaukee & St. Paul Railway. Each group presents an independent problem except that the amount of power that can be transferred under short-circuit conditions over the interconnecting lines between groups must be considered.

The Puget Sound network, which has been the chief problem of this committee, consists of a number of hydro-electric and steam generating stations aggregating 120,000 kw. rating, with 55-kv. transmission lines to the principal cities in parallel sets of two, three or four to each load center, depending on its importance. At important load centers receiving substations connect the 55-kv. supply through transformers to 13-kv. network consisting of parallel sets of two or more lines to the various distributing substations at proper centers for supplying railway, light and power and Edison service.

In the early days only the simplest overload trips were put on transmission lines. Later these were actuated by bellows-type relays. Among the improvements that have been gradually introduced on this system are the replacement of bellows-type relays with wattmeter-type relays for inverse-time-overload and power-directional trip and the installation of differential relays on transformers and thermal relays on generators. Balanced-current types are now being installed on some parallel lines, but no form of pilot wire control has as yet been believed advisable.

AVERAGE NUMBER OF CASES OF LINE TROUBLE PER YEAR PER 100 MILES OF CIRCUIT

	1907–8–9	1914–15–16	1917–18–19	1920–21–22
1. Dropping over 90 per cent of load	2.3	0.4	0.0	0.0
2. Dropping 50 per cent to 90 per cent of load	1.7	0.4	0.7	0.4
3. Dropping less than 50 per cent of load	4.1	5.4	3.5	4.8
4. Total	8.1	6.2	4.2	5.2

SPLIT SYSTEM IN HALVES

One decided improvement was effected a number of years ago when the increasing number of interconnections between loop and radial lines in the Seattle 13-kv. secondary transmission system began to complicate the network and make relay adjustment difficult. The system was split into two main halves and operated in synchronism but not in parallel except at the generating stations. Of the four 55-kv. supply lines into Seattle, two were taken into each of two main receiving substations, and from these 13-kv. secondary transmission lines radiate in parallel pairs to the distributing substations in various sections of the city. Each of these distributing substations has two 13-kv. buses, and each of the latter is supplied by lines from a separate receiving substation. The motor-generators and transformer banks in distributing substations are put partly on each bus, with automatic selector switches for transferring important loads if one bus goes dead. This scheme greatly simplifies relay protection and has improved reliability of operation, as most troubles are confined to one-half of the network and the other half can be overloaded long enough to clear up the situation. This overload is not noticeable except on the peak, as only the more important lighting and power loads are equipped with the automatic throw-over feature. The load dispatcher orders the picking up of railway and other power loads on such lines as have spare capacity.

There has been a steady trend toward improved operating reliability during the past fifteen years (see table), although system mileage has increased several hundred per cent and much of the equipment is getting older. The table is taken from records of the main portion of the Puget Sound transmission system only and excludes troubles elsewhere. The period from 1910 to 1913 is omitted as consolidations of companies were then under way and records incomplete. Although the total number of cases of line trouble cannot be controlled, the proportion of them which interrupt a large percentage of the load has been steadily decreased carried on the system.

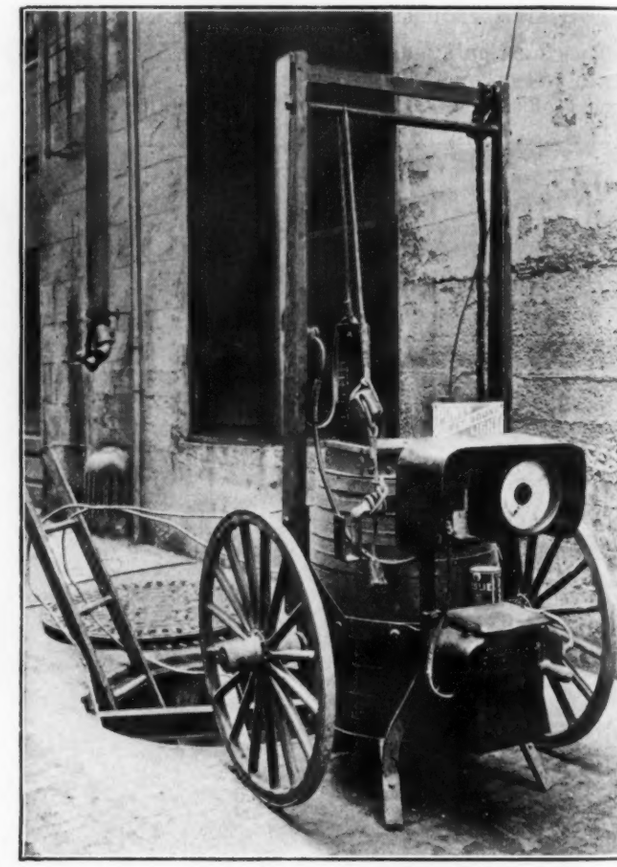


FIG. 3—PORTABLE WATER RHEOSTAT AND TESTING OUTFIT WITH AMMETER, CYCLE COUNTER, AND OIL SWITCH FOR CONTROL

Produces 2,500-volt short circuits for testing the operation of several hundred type CR power-directional relays installed in subway circuit breakers on 4,500-volt alternating-current underground system in Seattle. (See ELECTRICAL WORLD, Dec. 23, 1922, page 1375.)

The principal factors improving operating reliability are those resulting from the conscientious work of the entire personnel, and the relay committee is simply a convenient channel to insure co-operative work according to a definite plan. An illuminated and remote-controlled diagram board in the load-dispatching office combined with special flat-top telephone board has facilitated rapid work. Portable relay-testing outfits and definite testing schedules insure accuracy of relay operation. A short-circuit calculating table, recommended by the relay committee, is now being built which will facilitate the computations of circuit conditions in networks in the engineering department. Much is yet to be accomplished to bring the relay installation up to the highest state of the art, but steady progress is being made.

Electric Machinery Insurance

Provisions and Rates Standardized by Insurance Rating Bureau and Binding Upon Members—Five Kinds of Coverage—Engineering and Inspection Service and Methods of Handling Adjustments

FOURTEEN insurance companies in the United States are now engaged in insuring power plants and industrial plants against loss or damage resulting from an accident to electrical equipment and complete or partial loss of production resulting therefrom. Five kinds of coverage are offered. While the value of electrical equipment alone is sufficient to interest most power and industrial plants in insuring it against loss or damage, it is likely that the greatest interest will center around the protection against loss of production or the equivalent revenue, either through prevention of accidents, by the inspection and engineering service rendered by the insurance companies or by the "use and occupancy" policies. At the present time the rates, forms of coverage and conditions of insurance are standardized by the Steam Boiler and Flywheel Service Bureau, a mutual organization of insurance companies, and are binding upon all members writing electrical insurance in this country. Therefore, no company has any competitive advantage over another except in the engineering and inspection service which it offers to its patrons, in methods of handling adjustments and in its facility to dispose of claims. Some companies have developed very elaborate inspection organizations which can be of considerable help to operating companies not so well equipped or desiring some check upon their own inspection crews. Other companies have not progressed so far.

Electrical machinery insurance is relatively new in this country. It originated as far back as 1903 in England, but it was not until seventeen years later that a very limited form of electrical machinery insurance was started in the United States. Since then data have been collected by the insurance companies regarding the frequency and seriousness of failures of electrical apparatus in order to arrive at more accurate and scientific coverage and more accurately figured rates. The only hazards listed in the manual of the Insurance Rating Bureau on which insurance is not to be written are electric lamps, heating elements, lifting magnets, lightning arresters, magnetic chucks, primary and storage batteries and vacuum tubes. The standard policies also exclude (1) loss or damage from a breakdown caused by fire and loss or damage by fire outside of the machine, resulting from a breakdown; (2) liability for the value of, or the replacement or renewal of, fuses or brushes; (3) loss or damage from a breakdown while the machine is undergoing insulation breakdown tests, experimentations, repairs or drying out; (4) loss or damage due to the stoppage of plants or from other indirect result of breakdowns; (5) liability for the value of or the renewal or repair of any part of a machine or other object which has broken or failed because of the deterioration or weakness of such part produced by wear; (6) loss or damage from a breakdown caused directly or indirectly by inundation, strikes, riots or civil commotions; (7) loss or damage or liability therefor, except to machines described in the schedule of the policy, when such loss or damage is caused by the transmission or interruption of electrical energy on wires or conductors.

FIVE KINDS OF COVERAGE OBTAINABLE

There are five kinds of coverage available, as follows:

Property Loss.—This includes direct or immediate loss or damage to property owned by the assured and loss or damage to property of others for which the assured may be liable. This is the fundamental coverage.

A clause is inserted in such policies which requires the saving of the machinery for the inspection of the damage for adjustment. This is an absolute necessity in the policy, the insurance companies declare. Of course, any insurance company is at liberty to interpret that clause as liberally as it likes and to make just as wide departures from it as it desires when it thinks its interests are not being prejudiced. The experience so far has been that unless some such clause is in the contract unscrupulous insurers will endeavor to present bills after the accident has all been cleared up, repairs made and no physical evidence left as to what happened. Then it becomes a battle of words, and the truthfulness of the witnesses has to be determined before the company can know whether it is liable at all and, if so, for how much.

Public Liability.—This includes loss from the liability of the assured for injury or death of a person not employed by the assured, resulting from an accident as insured against. This insurance is excess over any other existing similar insurance.

Employees' and Workmen's Compensation.—This includes loss from the liability of the assured for injury or death of a person employed by the assured, resulting from an accident as insured against. This insurance is excess over any other existing similar insurance. This coverage can only be provided in states having no workmen's compensation laws, although in a few states having such laws it may be provided under limited conditions.

Of course, personal-injury coverage is not a thing which is especially important in connection with electrical machinery insurance, because it does not cover all sorts of electrical accidents to public or employees, but only accidents to the public and employees which might occur as a direct result of breakdown which the policy covers. Furthermore, all the companies writing insurance assume only that portion of the personal-injury liability in excess of that covered by other existing liability insurance which the assured may have. That is to say, if a man carries liability insurance in general and feels that there is a possibility of a catastrophe in connection with his electrical machinery which would cause his ordinary insurance to be exhausted, then he could buy personal-injury coverage for a very small sum in connection with electrical machinery coverage.

Consequential Loss.—This includes such indirect property damage as is not covered by the direct-damage

policy, such as damage to goods in storage that might be spoiled by a change in temperature, due to the failure of an electric motor driving an ammonia compressor.

Use and Occupancy.—This provides for the payment of a specified amount which should be sufficient to cover profits, overhead expenses, etc., for each day that the policy holder is unable to carry on his business because of accident as insured against.

ELECTRICAL MACHINERY, BREAKDOWN AND ACCIDENT DEFINED

In all of the electrical machinery insurance policies, electric machinery is defined as follows:

Electrical machinery is any apparatus for the generation, transmission or utilization of electrical energy in any form. Such electrical machinery insured under the policy shall include the wheels and gears, if any, mounted on the shaft of the machine. It shall not include any mechanism or appliance driving or driven by the machine or connected to it by any couplings, belt, gear or other means, whether mounted with it on a common shaft or bed or otherwise, nor any wiring beyond the machine terminals, nor shall it include any continuous shaft, with its bearings, which is common to the machine and to an engine, other prime mover or other object with which it forms a direct-connected unit, nor any wheels or gears on such shaft.

The word "breakdown" shall mean only the sudden, substantial (or actual) and accidental breaking or burning-out of the machine or any part thereof, while in use or installed and connected ready for use, which immediately stops the functions of the machine and which necessitates repair or replacement before its functions can be restored.

The word "accident" shall mean the breakdown of a machine or other object insured under the policy and shall include all resultant or concomitant breakdowns whether of one or more than one such machine or object.

PHYSICAL FORMS OF POLICIES MAY DIFFER

While the insurance companies have agreed among themselves to follow uniform practices in covering electrical machinery insurance risks and have mutually agreed to make these practices mandatory, the physical forms in which different companies furnish electrical machinery insurance may differ. Some companies issue a general electrical machinery policy to which may be attached indorsements for use and occupancy, injury to employees or others, consequential loss, etc. Other companies cover the direct damage to machinery and loss of production in separate policies, generally called "electrical machinery direct-damage" policy and "electric machinery use-and-occupancy" policy, respectively.

There are two standard forms under which "use and occupancy" insurance may be written. These forms are similar in the following respects:

1. Indemnity must be excluded for all loss occurring prior to the eighth midnight following the time when telegraphic or written notice of accident, sent by the assured to the company, reaches the home office city of the company. However, for an additional premium, the word "eighth" may be changed to "seventh," "sixth," "fifth," "fourth," "third," "second" or "first." No loss occurring during the period of exclusion shall be covered even though the period of shutdown exceeds the period of exclusion; neither shall any loss occurring prior to the first midnight following the notice of the accident be covered under any conditions.

2. The term "day" shall mean a period of twenty-four consecutive hours beginning at midnight.

3. The policy shall exclude all loss due to lack of occupancy or use of any part of the buildings or machinery subsequent to the time when such part could, with reasonable diligence and dispatch, have been restored or rebuilt and made ready for occupancy or use or its function supplied some other way. The assured shall be required to take such means as the company directs, at the company's expense, to reduce the loss, such expense to be a part of the total limit.

4. The policy shall exclude all loss for any day on which the regular work of production would not have been carried on if the accident had not occurred.

PREMIUMS FOR ELECTRICAL EQUIPMENT OTHER THAN THAT INCLUDED IN TABLE "ELECTRICAL MACHINERY PREMIUMS"*

Equipment and Voltage	Multiplier
Alternating-current motors:	
751 to 5,000 volts	1.4 × D.C.
Over 5,000 volts	1.8 × D.C.
Direct-current motors:	
301 to 750 volts	1.2 × D.C.
751 to 1,500 volts	1.6 × D.C.
Over 1,500 volts	2.0 × D.C.
Alternating-current generators:	
5,000 volts or less	0.9 × D.C.
Over 5,000 volts	1.1 × D.C.
Direct-current generators:	
300 volts or less	1.0 × D.C.
301 to 750 volts	1.2 × D.C.
751 to 1,500 volts	1.6 × D.C.
Over 1,500 volts	2.0 × D.C.
Rotary converters:	
300 volts or less	4.0 × D.C.
301 to 750 volts	4.3 × D.C.
751 to 1,500 volts	4.6 × D.C.
Over 1,500 volts	5.0 × D.C.
Dynamotors:	
All voltages	1.4 × D.C.
Single-phase transformers:	
2,400 volts or less	0.5 × basic
2,401 to 6,600 volts	0.6 × basic
6,601 to 22,000 volts	0.8 × basic
Over 22,000 volts	1.2 × basic
Three-phase transformers:	
2,400 volts or less	0.7 × basic
2,401 to 6,600 volts	0.8 × basic
6,601 to 22,000 volts	1.0 × basic
Over 22,000 volts	1.4 × basic

*Approximate quotations will be had by applying the multipliers to the "D.C." premiums or "transformer basic rates" given in the large table. Equipment of a type other than listed above (miscellaneous non-rotating equipment) has a rate of 4 per cent of the limit applicable to each piece or each switchboard.

5. The total limit of liability shall be 100 times the daily indemnity, or some multiple of 50 in excess of 100 times the daily indemnity, and this shall be in addition to and not a part of other insurance applicable to property damage and personal injury.

6. The total limit of liability shall be the limit for each accident occurring during the policy period.

The two forms of policy available for "use and occupancy" insurance differ in the following respects:

OPTIONAL FORMS FOR USE AND OCCUPANCY

FORM "A":

Total Prevention.—The policy shall provide that the company shall pay the specified daily indemnity for each day of total prevention of production if current production is equal to or greater than normal production, and that if current production is less than normal production, the company shall pay that proportion of the specified daily indemnity that current production bears to normal production.

Partial Prevention.—The policy shall provide that the company shall pay for each day of partial prevention that proportion of the amount which would have been paid in the event of a total prevention of production that the production prevented (obtained by deducting from current production the actual production during such day of partial prevention) bears to current production.

Normal Production.—One three-hundred-and-sixty-fifth of the total production on the premises described in the policy for one year next preceding the day of the accident.

Current Production.—Current production shall be considered as one-fifth of the total production on all the premises described in the policy during the five days next preceding the day of the accident or during any other five consecutive days which the assured may select from the last sixty days next preceding the day of the accident.

FORM "B":

Total Prevention.—The policy shall provide that the company shall pay the specified daily indemnity for each day of total prevention of production.

Partial Prevention.—The policy shall provide that the company shall pay for each day of partial prevention that proportion of the amount which would have been paid in the event of a total prevention of production that the production prevented (obtained by deducting from current production the actual production during such day of partial prevention) bears to current production.

Current Production.—This shall be the daily average production of the producing days of the fifty-two weeks next preceding the accident.

The period of the exclusion required in the "use and occupancy" policies is to provide the insurance com-

pany with reasonable time and opportunity to examine thoroughly the electrical machinery and the premises in which it is installed before any repairs are commenced. The insurance company may require the assured to take such temporary or permanent measures to restore production as it may elect. The insurance companies hold themselves liable for the expense incurred by their direction for temporary restoration of production, but not for the expense of permanently preventing loss when such expense is a part of the direct loss or damage from the accident covered by the "electric machinery direct-damage" policy.

In the case of seasonal businesses where the profits are greater during one portion of the year than another, the "use and occupancy" protection may be written to provide a higher daily indemnity during one season than during the others.

RATES FOR ELECTRICAL INSURANCE

To determine the rates which should be charged for electric machinery insurance, the companies' engineers, in co-operation with other engineers, have obtained from all classes of operating companies data regarding different machines in operation, length of time operated, length of interruption in service, extent of loss, etc. From these data it has been possible to determine the loss frequency and extent of loss for all classes of equipment. On this basis the more common makes of machines have been arranged in a classification schedule somewhat like that shown in the accompanying table, which refers to generators, motors, rotary converters and transformers. At the present time miscellaneous equipment, such as switchboards, meter regulators, oil switches, reactor coils, etc., are grouped under miscellaneous non-rotating equipment, but just as fast as data based on experience are acquired on this equipment it will be specifically rated and placed in the classification schedule like generators, motors, etc.

When the occasion arises the rates will be adjusted for different classes of machinery and for different conditions of operation so that one class of equipment will not suffer high rates on account of extra hazard in another class. For instance, it may be necessary to increase the rates on oil circuit breakers, but this will not necessarily increase rates on motors and generators and may even allow a decrease.

In general the rates for rotating electrical machinery are based on the character of current, highest rated voltage, capacity, speed in revolutions per minute, limit per accident and kind of coverage. The rates for transformers are based on the number of phases, highest rated voltage, capacity, limit per accident and

ELECTRICAL MACHINERY PREMIUMS

(Subject to change without notice)

A. C. Motors, 750 Volts or Less. D. C. Motors, 300 Volts or Less. One Year Premiums. Property Only. $1,000 Limit.

1. Premiums noted below are One Year premiums for the individual machine. To obtain the full policy premium for a given risk, total the various individual machine premiums and add one location charge for each location. Location charge, per year, for District No. 1, is: $5.40 for $1,000 limit; $5.60 for $2,000 limit; $5.70 for $3,000 limit; $5.80 for $4,000 limit; $5.90 for $5,000 limit; $7.78 for $10,000 limit; $11.48 for $20,000 limit. For District No. 2 increase each location charge $2.00; for District No. 3 increase each location charge $4.00; for District No. 4 increase each location charge $6.00.
2. For Limits in excess of $1,000, consult the Manual; but if an approximate quotation is desired, add to these premiums 1 % for each additional $1,000 of insurance. Motors over 50 H. P. should carry at least $5,000 limit; 200 H. P. $10,000 limit; and proportionately higher limits for motors of larger H. P. Generators and Rotary Converters (see reverse side of card for rates) should carry Limits at least twice as large as for corresponding size motors.
3. These premiums cover Property Damage only. For Personal Injury Coverage, Use and Occupancy and Consequential Loss Insurance, consult the Manual.
4. Three Year coverage may be provided for 2½ times One Year premiums.

Capacity K. V. A.	300 R.P.M. or less		301 to 450 R.P.M.		451 to 600 R.P.M.		601 to 900 R.P.M.		901 to 1,200 R.P.M.		OVER 1,200 R.P.M.		Transformer Basic Rate
H. P. or K.W.	A. C.	D. C.	A. C.	D. C.	A. C.	D. C.	A. C.	D. C.	A. C.	D. C.	A. C.	D. C.	
NOTE: For capacity, use K.V.A. if given; if not, use H. P. for motors and K. W. for other equipment. For intermediate capacities use the next higher number shown in the table. Where motors have several speeds use the lowest; if no speed is given, assume 600 R. P. M.													
½	$4.84	$4.04	$4.44	$3.64	$4.04	$3.23	$3.23	$2.83	$2.83	$2.42	$2.83	$2.42	$2.42
1	8.08	6.87	7.27	6.06	6.46	5.25	5.25	4.44	4.84	4.04	4.84	4.04	4.04
2	12.12	10.10	10.10	8.48	8.08	6.87	7.27	6.06	6.46	5.25	5.25	4.44	5.25
3	14.95	12.52	12.12	10.10	10.10	8.48	8.08	6.87	7.68	6.46	6.46	5.25	6.46
5	18.99	15.76	15.35	12.93	13.74	11.31	10.50	8.89	9.70	8.08	7.68	6.46	8.08
7½	23.43	19.39	18.99	15.76	16.56	13.74	13.74	11.31	11.72	9.70	9.29	7.68	9.70
10	26.66	22.22	21.82	18.18	18.99	15.76	15.35	12.93	13.74	11.31	10.50	8.89	11.31
12½	29.49	24.64	24.24	20.20	21.41	17.78	17.37	14.54	14.95	12,52	12.12	10.10	12.93
15	32.32	27.07	26.66	22.22	23.43	19.39	18.99	15.76	16.56	13.74	13.74	11.31	14.14
20	37.17	31.11	31.11	25.86	26.66	22.22	21.82	18.18	18.99	15.76	15.35	12.93	16.97
25	41.61	34.74	34.74	29.09	29.49	24.64	24.24	20.20	21.41	17.78	17.37	14.54	19.39
30	45.65	37.98	37.98	31.51	32.32	27.07	26.66	22.22	23.43	19.39	18.99	15.76	21.41
35	48.88	40.80	40.40	33.53	34.74	29.09	29.09	24.24	24.64	20.60	20.20	16.96	23.03
40	51.31	42.82	42.82	35.55	37.17	31.10	31.11	25.86	26.66	22.22	21.82	18.18	24.64
50	56.16	46.86	47.67	39.59	41.61	34.74	34.74	29.09	29.49	24.64	24.24	20.20	27.47
60	61.41	51.31	51.31	42.82	45.65	37.98	37.98	31.51	32.32	27.07	26.66	22.22	29.90
75	68.28	56.96	56.16	46.86	50.10	41.61	41.61	34.74	36.76	30.70	29.49	24.64	33.53
100	78.38	65.45	64.64	53.73	56.16	46.86	47.67	39.59	41.61	34.74	34.74	29.09	37.98
125	88.07	73.53	71.91	59.79	62.62	52.12	52.52	43.63	46.46	38.78	38.78	32 32	41.61
150	96.96	80.80	78.38	65.45	68.28	56.96	56.16	46.86	50.10	41.61	41.61	34.74	45.25
175	105.04	87.67	85.24	71.10	73.53	61.41	60.60	50.50	53.33	44.44	44.44	37.17	48.48
200	113.12	94.13	91.72	76.36	78.38	65.45	64.64	53.73	56.16	46.86	47.67	39.59	51.31
250	127.66	106.25	102.62	85.65	88.07	73.53	71.91	59.79	62.62	52.12	52.52	43.63	56.96
300	141.00	117.56	113.12	94.13	96.96	80.80	78.38	65.45	68.28	56.96	56.16	46.86	62.22
350	154.33	128.47	122.82	102.21	105.04	87.67	85.24	71.10	73.53	61.41	60.60	50.50	67.47
400	166.45	138.57	132.51	110.29	113.12	94.13	91.72	76.36	78.38	65.45	64.64	53.73	72.32
450	177.36	147.86	141.00	117.56	120.39	100.19	96.96	80.80	83.22	69.49	68.28	56.96	76.76
500	189.07	157.56	150.29	125.24	127.66	106.25	102.62	85.65	88.07	73.53	71.91	59.79	80.80
600	208.46	173.72	166.45	138.57	141.00	117.56	113.12	94.13	96.96	80.80	78.38	65.45	88.88
700	227.86	189.88	181.80	151.50	154.33	128.47	122.82	102.21	105.04	87.67	85.24	71.10	96.96
800	247.25	206.04	196.34	163.62	166.45	138.57	132.51	110.29	113.12	94.13	91.72	76.36	104.23
900	266.64	222.22	208.46	173.72	177.36	147.86	141.00	117.56	120.39	100.19	96.96	80.80	111.10
1,000	283.61	236.34	223.01	185.84	189.07	157.56	150.29	125.24	127.66	106.25	102.62	85.64	117.16
1,250	324.82	270.68	254.52	212.10	213.31	177.76	169.68	141.40	143.02	119.18	115.54	96.15	133.32
1,500	363.60	303.00	283.61	236.34	237.55	197.96	189.07	157.56	159.98	133.32	127.66	106.25	147.46
1,750	399.96	333.30	310,27	258.56	261.79	218.60	206.04	171.70	174.53	145.44	138.98	115.95	161.60
2,000	436.32	363.60	339.36	282.80	283.61	236.34	223.01	185.84	189.07	157.56	150.29	125.24	173.72
2,500	500.96	416.12	387.84	323.20	324.82	270.68	254.52	212.10	213.31	177.76	169.68	141.40	197.96
3,000	561.56	468.64	436.32	363.60	363.60	303.00	283.61	236.34	237.55	197.96	189.07	157.56	222.20
3,500	626.20	521.16	480.76	399.96	399.96	333.30	310.27	258.56	261.79	218.16	206.04	171.70	242.40
4,000	678.72	565.60	517.12	432.28	436.32	363.60	339.36	282.80	283.61	236.34	223.01	185.84	262.60
5,000	779.72	650.44	601.96	500.96	500.96	416.12	387.84	323.20	324.82	270.68	254.52	212.10	303.00

See Back of Card for Premiums on other Electrical Equipment.

kind of coverage. All rates are based on the nameplate data, regardless of whether the equipment is used in accordance with these data or not.

When figuring insurance on any piece of equipment, the object charge is first determined from the insurance manual, and to it is added the insurance charge, which is 1 per cent of the object charge for each $1,000 of insurance. The object charge reflects the hazards of different types of machines in accordance with the varying cost of replacements, and the insurance charge reflects the additional hazard on account of the excess limits of insurance. Regardless of the number of machines operated, there is a location charge of a few dollars per thousand, depending upon the amount of insurance and the location of the risk. This is done to compensate for the difference in inspection costs in different parts of the country and is higher for localities remote from the major cities than it is from those which are close by. The table of electrical machinery premiums is reproduced on page 425 just as it is printed in the rate card issued by one of the insurance companies. The smaller table on page 424, also taken from the rate card, shows approximate premiums for electrical equipment not included in the large table.

The cost of obtaining "use and occupancy" protection may be illustrated by a specific example. For instance, if a company desires indemnity for a total loss of revenue or loss of use to the amount of $1,000 per day, with a total limit of 200 times the daily indemnity, and wishes indemnity on the first midnight after breakdown, the three-year premium for this loss of use coverage is $2,380 exclusive of the premium for direct-damage coverage. If the insurance desired is $100 per day with a limit of 100 times the daily indemnity beginning on the first midnight, the premium would be $200 exclusive of the premium for direct damage. However, "use and occupancy" is almost invariably written with a policy for "direct-damage" coverage.

ENGINEERING SERVICE A FEATURE

While the question of insurance and the reimbursement for losses sustained as a result of accidents to electrical machinery are important factors, the insurance companies believe that one of the most important features of this class of insurance is the engineering service which accompanies it. Even if the engineers inspecting the equipment for the insurance company cannot recommend any improvements in the electrical equipment of a plant, the service is still of great value because of the psychological effect upon the employees of the assured, who know that they will be "checked up" by a disinterested expert. Some insurance companies have pointed out that the inspection service is highly respected, not only by small companies without sufficient equipment to justify employing an expert maintenance force, but also by the larger companies where the most competent men obtainable are taking care of the electrical equipment. At least one large manufacturing company has highly recommended this inspection and engineering service by saying:

"The service operates to provide the assured with suggestions and recommendations for the improvement of operating conditions and the prevention of loss. We feel that this insurance is of great benefit to us as manufacturers of electrical apparatus as it will tend toward better inspection and maintenance in the hands of our customers."

Number of Generating Plants Now Totals 5,419

DATA just made available by the United States Census Bureau indicate that on January 1, 1923, there were a total of 5,419 generating stations in the electric light and power industry. In 1917 there were 5,243 generating plants, indicating an increase of 176 during the five-year period, or an average of thirty-five new plants per year.

On January 1, 1923, there were a total of 6,612 operating companies, including those which generate, those which purchase only and those which both purchase and generate electrical energy. This is an increase of seventy operating companies since 1917.

The total output during 1922 of the 5,419 generating stations was 38,288,312,522 kw.-hr. This figure must not be confused with the figure which is issued by the United States Geological Survey. The latter figure includes energy generated by electric railways, reclamation service plants and a few large manufacturing companies which sell direct to other manufacturers. New York leads in the amount of energy generated for central stations with 4,684,210,464 kw.-hr., followed by Pennsylvania and California in order.

CENTRAL-STATION OPERATING COMPANIES AND GENERATING PLANTS AS OF JANUARY 1, 1923

States	Number of Operating Companies Generating, Purchasing and Both Generating and Purchasing Energy	Number of Generating Stations	Kilowatt-Hours Generated (1922)
United States	6,612	5,419	38,288,312,552
New England	364	319	2,966,266,880
Maine	82	72	278,439,296
New Hampshire	57	52	94,712,707
Vermont	56	68	206,513,228
Massachusetts	117	87	1,501,488,253
Rhode Island	8	5	341,592,302
Connecticut	44	35	543,521,094
Middle Atlantic	594	614	9,998,794,158
New York	291	256	4,684,210,464
New Jersey	60	62	1,061,086,418
Pennsylvania	243	196	4,253,497,276
East North Central	1,685	996	9,137,315,759
Ohio	298	176	2,147,637,297
Indiana	212	141	792,010,943
Illinois	284	211	3,122,899,055
Michigan	638	271	2,033,686,659
Wisconsin	253	197	1,041,081,805
West North Central	1,720	1,290	3,057,573,303
Minnesota	254	169	598,425,862
Iowa	295	179	862,926,599
Missouri	240	190	870,101,325
North Dakota	152	153	39,203,547
South Dakota	149	131	59,592,947
Nebraska	340	280	277,169,333
Kansas	290	188	350,153,690
South Atlantic	765	584	2,641,966,009
Delaware	9	6	2,018,529
Maryland	44	35	343,697,303
Dist. of Columbia	1	2	251,979,077
Virginia	99	13	353,940,720
West Virginia	66	56	164,175,280
North Carolina	182	133	414,202,324
South Carolina	87	78	844,616,572
Georgia	176	158	136,230,805
Florida	101	103	131,105,399
East South Central	427	418	1,392,355,143
Kentucky	138	134	223,364,595
Tennessee	110	105	490,587,917
Alabama	72	76	633,520,091
Mississippi	107	103	44,882,540
West South Central	477	632	1,044,240,716
Arkansas	87	91	84,598,392
Louisiana	81	83	62,647,103
Oklahoma	19	177	228,874,904
Texas	290	281	668,120,317
Mountain	352	376	2,972,526,537
Montana	64	76	1,467,589,940
Idaho	43	48	227,039,573
Wyoming	41	41	33,091,051
Colorado	79	69	290,012,787
New Mexico	31	32	17,252,364
Arizona	35	32	150,831,084
Utah	47	65	741,045,629
Nevada	12	13	45,664,109
Pacific	228	290	5,077,274,047
Washington	80	78	678,237,664
Oregon	61	64	148,612,854
California	87	148	4,250,423,529

Who Sells Electrical Appliances?—V

A City of 800,000

"Electrical World" Survey of Retail Appliance Selling in a City Where the Central Station Is the Chief Merchandiser and Contractor-Dealers Are Dissatisfied

RETAIL appliance selling in all of the cities thus far investigated by the *Electrical World* has been found to present some marked differences, each city having individual characteristics peculiar to itself. In the city here described the central-station company renews certain sizes of incandescent lamps free of charge with some limitations as to class of customer. It is also an active merchandiser of electrical appliances. To both of these practices strictly electrical dealers object strenuously, but non-electrical dealers do not appear to be much concerned.

OFFICIALLY the population of this city is given as 800,000, but its many closely gathered suburbs go to make up a population of more than a million and a quarter. Nearly all of this territory is served by one central-station company, but there are three other electric light and power companies operating in suburban towns. All are active merchandisers, and in the case of the largest company incandescent lamps are renewed free for customers.

Electrical appliances are sold by dealers of the following seven classifications: hardware stores, sporting-goods stores, department stores, electric shops, electrical contractor-dealers, electric specialty stores and central-station companies.

HARDWARE AND SPORTING-GOODS STORES

Combined, the total sales of hardware and sporting-goods stores amount to a little less than 1 per cent of the total for the city. Hardware dealer "A" considered the electric appliance business as only "fair." It is confined almost entirely to heating appliances and the few sales of vacuum cleaners he termed "accidental."

Hardware dealers as a class had no criticisms to make of competition from other dealers. They all believed that electrical appliances are a logical part of their business, that there is a steady though moderate demand throughout the entire year and that servicing is not a serious problem. Discounts are held to be a little shorter than desirable, and a spread of at least 40 per cent is wanted. A little more would be preferable.

Two of the sporting-goods stores are on one of the main shopping arteries, and both carry standard lines of merchandise. Radio equipment is the principal feature of their electrical business, and both of the stores were inclined to shorten their activities in the sale of appliances. Apparently they became overenthusiastic on the strength of the radio business, and upon attempting to branch out on heating devices they were disappointed in the results.

None of the sporting-goods or hardware stores expressed the intention of abandoning electric appliance sales, as they believed the business is paying its way. However, they looked for a very slow increase from year to year and felt that they could spend their efforts more profitably in pushing such merchandise as is more closely related to their business.

Of the six department stores visited there were three which might be classed as active electric merchandisers. The first store, "DA," was the largest of its kind in the city. It stands high with its customers and follows an aggressive sales policy. Electrical appliances are carried in the house-furnishing department, prominently displayed on that part of the floor directly in front of and alongside of the elevators. The house-furnishing department manager was a shrewd and capable merchant with very definite and practical ideas for conducting his electric appliance business.

Two or three things which need adjustment, in order to make the appliance business more attractive, were mentioned by this manager. Too much servicing is being done, and he believes this is due, first, to imperfection of design or material; second, to the practice of central-station companies making free repairs, thus getting customers into the habit of expecting perpetual service; third, inadequate instruction is given to the user at the time of purchase. The present prices, he thought, are too high and discounts are inadequate, although he pointed out that virtually all his purchases are made direct from manufacturers. He criticised the small electrical dealer for his sales methods, particularly calling attention to the poor display of merchandise and ineffective use of advertising.

This particular store in 1922 obtained a job lot of electric washing machines from a manufacturer who was closing out his line, advertised machines at $68 apiece, about half of the former retail price, and sold during the year 2,500. The department manager was highly pleased with the success of this sale, but nearly all other electrical dealers in the city complained that the washing-machine market in 1923 was shot to pieces because the public felt that $68 was enough to pay for any washer. The store manager was particularly keen on the development of such devices as the electric range, fireless cooker, electric refrigerator and other high-priced devices. He pointed out that such appliances give a real and continuous service to the user, and there is sufficient profit from one sale to make it possible to devote specialized selling service to the particular device.

The next department store, "DB," carried all electrical appliances in its basement store grouped in one location. Both vacuum cleaners and washing machines were carried on a resale agreement, and the men in charge of this work complained seriously of lack of co-operation from the house-furnishing department manager. The department manager was rather apathetic concerning the electric appliance business and appeared to feel that it was included because of necessity instead of possible profit. Questioned as to why he devoted so

little floor space and advertising to electrical devices, he replied that as much was allotted to them as the volume of the sales warranted.

Department store "DC" sold only two kinds of appliances—vacuum cleaners, which were carried on a resale plan, and curling irons, which were a part of the merchandise carried with toilet articles. The store was essentially a woman's wear store, and no housefurnishing department was maintained.

Department store "DD" catered to a medium-price business, and electrical merchandise was carried in the housefurnishing department in the basement. The department manager indicated that the appliance business was growing steadily and sales for 1923 would show about 20 per cent increase over 1922.

ELECTRICAL DEALERS

Under this classification there were two dealers which may be classed as electric shops. Store "G" was well located in the shopping district, and the owner was very frank in his criticism of the retail electric business. He has abandoned wiring and general contracting work and is devoting most of his attention to the sale of radio sets and supplies, while electric household devices are of secondary consideration. He finds the appliance business unattractive because, he said, discounts are entirely too short, particularly for the small dealers, as manufacturers are favoring the department store and large buyers, at the same time using jobbers as a means to inveigle electrical contractors and small dealers into buying electrical appliances at discounts which are too short to afford any profit. Coupled with this is the cost of servicing appliances, which falls directly upon the retail dealer. In addition to this, he asserted, the average contractor cannot be a successful merchandiser because he knows too little of the routine of selling and the two businesses do not appear to fit together. The central-station company's merchandising policy came in for criticism, mostly because this dealer thought that the company is taking advantage of its natural monopoly of the electric light and power business. In his opinion, the company is trying to extend its monopoly into the merchandising field, with the result that electrical dealers in particular and the public in general resent it.

Store "H" was in the same block with the central-station company's main office and salesroom. The proprietor here felt that he benefited materially not only by his location but by the fact that the central-station company was in the merchandising business, and he questioned if he would benefit if the company retired from the field. On the whole, he found the electric appliance business profitable because of careful buying and rapid turnover, although discounts from jobbers on some lines are not all that could be desired.

CONTRACTOR-DEALERS

Of the electrical contractor-dealers there was but one, listed in the tabulation as dealer "J," who appeared to be in a happy frame of mind. His store was outside of the main shopping district but in a very good location, and his appliance business, which amounted to about $50,000 per year, was estimated at being approximately 25 per cent of the firm's total business of contracting and sales. Salesroom and windows were attractive, and salespeople on the floor were courteous and attentive to customers. His only criticism of the central-station company's policy was that it cut prices. The question of lamp renewals did not appear to bother him greatly. He thought that the other electrical contractor-dealers who were complaining of the company's merchandising policy and free lamp renewals were failing to do a real job of selling and were taking this method of complaint as an excuse for their failure to do a larger volume of business.

The opinions of other electrical contractor-dealers were very much alike. They all disapproved of the central-station company's selling electrical appliances because they thought it was trying to monopolize the field and that its reduced prices and easy terms were driving them out of the appliance business. Also, free lamp renewals were taking away a good share of their bread-and-butter business, and they felt that the company should be required to discontinue this practice.

On the sale of the large devices, such as washing machines and vacuum cleaners, contractor-dealers all agreed that discounts were insufficient because of the servicing required and the expense of carrying deferred-payment accounts. Contractor-dealers all appeared to feel that the central-station company is trying to put them out of business, but the actual practice of the company, which will be outlined later, does not bear this out.

SPECIALTY STORES

Several specialty or factory branch stores were operating, and it was generally found that they had been established because the manufacturers had been unable to find satisfactory retail dealers to act as their representatives. All specialty stores maintained outside selling crews, and all admitted that it was difficult to obtain satisfactory men for this work. Store "T," a factory branch representative, was particularly antagonistic toward the central-station company, believing that it was trying to monopolize the appliance business. The manager criticised the company's deferred-payment plan, its practice of offering premiums with the sale of washing machines and vacuum cleaners, and he believed that the Public Service Commission should rule the company out of the merchandising business. Other specialty and factory branch stores were not so severe in their criticism of the central-station company, but all believe that the company should at least maintain prices.

CENTRAL STATIONS

While there are four companies listed in the tabulation as selling appliances, the one large company dominates the local situation and receives all of the criticism. For this reason its practice and policies will be discussed. The company pursues an aggressive merchandising policy because in the opinion of its president, and the general manager as well, electrical dealers will not sell sufficient merchandise nor will they give customers the proper kind of service in the repair and maintenance of appliances. The company renews free of charge incandescent lamps in the 50-watt size and over and renews the smaller sizes for a nominal charge.

The company conducts sales throughout the year, during which special prices are made for different appliances, and sometimes premiums are included with the sale. Vacuum cleaners and washing machines are carried on resale plans, and the premium feature is used here also. In defense of this policy the commercial manager of the company said that he believed there is in this particular section of the country what might be termed a "price market" and price reduction is the

best method of stimulating sales. With regard to the offering of premiums, he pointed out that competitors who criticised the company's policy are quite as bad offenders in this respect. The company's time-payment offer on appliances purposely has been made as attractive as possible, so that a class of people can be reached that could not afford to buy on any less liberal terms.

It is the company's policy to aid in every way possible all retail electrical dealers. Within the last year more than $20,000 has been spent by the company for electrical expositions and demonstrations. In one of the suburbs the company undertook to retire from the merchandising business and leave the field entirely to the contractor-dealers. After about a year customers complained that they were unable to get service on appliances, that they could not buy them at attractive terms and that they could not always get the device that they wanted. It has since been necessary for the company to re-enter the merchandising business.

The merchandising manager stated that while the company aims to make a profit from its appliance sales, and while accurate accounts are kept, a loss is shown because of the large amount of promotional expenses which are charged against the department. He advocated better discounts and believed that the business could be made to pay a profit if it were operated on a strictly merchandising basis.

CONCLUSION

From the accompanying tabulation it will be seen that hardware and sporting-goods stores may be eliminated as important retail outlets. Considering the five other classes of dealers, central-station company sales, amounting to a little more than 40 per cent of the total, are by

SALES OF PRINCIPAL ELECTRICAL APPLIANCES, SHOWING QUANTITY, VALUE AND PROPORTION SOLD BY HARDWARE, SPORTING-GOODS AND DEPARTMENT STORES, ELECTRICAL DEALERS AND THE CENTRAL-STATION COMPANIES

Kind of Dealer	Washing Machines	Vacuum Cleaners	Ironers	Flatirons	Curling Irons	Toasters	Percolators	Total Sales Each Class of Store	Per Cent of Total for City
Hardware Stores									
Store "A"	.....	18	.....	150	50	36	24		
Store "B"	.....	25	.....	175	60	48	30		
Store "C"	.....	.....	.....	125	72	50	18		
Total	.....	43	.....	450	182	134	72		
Value	.....	$2,258	.....	$2,700	$773	$804	$864	$7,399	0.4
Per cent of electric appliance sales	.....	30.5	.....	36.5	10.5	10.8	11.7		
Sporting-Goods Stores									
Store "D"	.....	.....	.....	100	48	50	25		
Store "E"	.....	.....	.....	180	80	60	18		
Store "F"	.....	.....	.....	120	60	48	20		
Total	.....	.....	.....	400	188	158	63		
Value	.....	.....	.....	$2,400	$799	$948	$756	$4,903	0.3
Per cent of electric appliance sales	.....	.....	.....	48.8	16.3	19.4	15.5		
Department Stores									
Store "DA"	500	3,000	20	2,500	1,800	1,200	500		
Store "DB"	100	450	15	600	650	325	175		
Store "DC"	.....	1,000	.....	.....	750	.....	.....		
Store "DD"	300	900	.....	1,200	475	350	120		
Total	900	5,350	35	4,300	3,675	1,875	795		
Value	$112,500	$280,875	$5,250	$25,800	$15,619	$11,250	$9,540	$460,834	29.0
Per cent of electric appliance sales	24.4	61	1.1	5.6	3.4	2.4	2.1		
Electric Shops									
Store "G"	30	50	.....	175	100	75	25		
Store "H"	50	100	.....	650	400	350	120		
Total	80	150	.....	825	500	425	145		
Value	$10,000	$7,875	.....	$4,950	$2,125	2,550	$1,740	$29,240	1.8
Per cent of electric appliance sales	34.3	26.9	.....	16.9	7.3	8.7	5.9		
Contractor-Dealers									
Dealer "I"	200	200	.....	750	300	200	75		
Dealer "J"	125	275	6	450	250	175	100		
Dealer "K"	24	36	.....	120	60	48	12		
Dealer "L"	.....	25	.....	250	144	150	48		
Dealer "M"	48	120	.....	325	90	124	30		
Dealer "N"	12	30	.....	100	36	30	12		
Dealer "O"	15	24	.....	72	40	48	18		
Dealer "P"	.....	.....	.....	60	24	30	12		
Dealer "Q"	6	18	.....	84	36	40	10		
Dealer "R"	18	30	.....	125	40	48	15		
Dealer "S" (misc. cont.-dlrs.)	150	225	.....	400	125	180	60		
Total	598	1,013	6	2,736	1,145	1,073	392		
Value	$74,750	$53,182	$900	$16,416	$4,866	$6,438	$4,704	$161,256	10.1
Per cent of electric appliance sales	46.3	32.9	0.6	10.3	3	4	2.9		
Specialty Stores									
Store "T"	400	300	100	.....	.....	.....	.....		
Store "U"	300	700	40	.....	.....	.....	.....		
Store "V"	325	.....	.....	.....	.....	.....	.....		
Store "W"	.....	500	.....	.....	.....	.....	.....		
Store "X"	225	.....	.....	.....	.....	.....	.....		
Store "Y"	275	.....	.....	.....	.....	.....	.....		
Total	1,525	1,500	140						
Value	$190,625	$78,750	$21,000	.....	.....	.....	.....	$290,375	18.3
Per cent of electric appliance sales	65.5	27.2	7.3	.....	.....	.....	.....		
Central-Station Companies									
Company "CA"	1,139	3,309	20	10,639	1,000	2,247	685		
Company "CB"	80	350	17	600	70	175	15		
Company "CC"	600	1,000	20	2,000	100	500	250		
Company "CD"	200	250	10	250	50	75	25		
Total	2,019	4,909	67	13,489	1,220	2,997	975		
Value	$252,375	$257,722	$10,050	$80,934	$5,185	$17,982	$11,700	$635,948	40.1
Per cent of company's appliance sales	39.8	40.5	1.6	12.7	0.8	2.8	1.8		
Grand Total									
All dealers	5,122	12,965	248	21,200	6,910	6,662	2,442		
Value	$640,250	$680,662	$37,200	$133,200	$29,367	$39,972	$29,304	$1,589,955	100.0
Per cent of total sales	40.3	42.8	2.3	8.5	1.8	2.5	1.8		

far the largest. Department stores come next with a percentage of 29, then follow the specialty stores, which sell 18.3 per cent, then the contractor-dealers with 10.1 per cent, and lastly, the electric shops with 1.8 per cent. The combined sales by electric shops, contractor-dealers and specialty stores total 30.2 per cent, which is but a little more that those of the department stores.

It was very difficult to sense any definite change or trend in the selling of appliances from one class of dealer to another. The department stores reported a general increase in sales for 1923 of from 15 to 25 per cent over the previous year. Based on the money value of appliances sold, the largest central-station company's sales had increased 50 per cent over 1922. Generally speaking, electrical dealers of all classes report only moderate increases of 15 to 20 per cent, while some of the specialty stores say that business has actually decreased and several of these have dropped out of business.

All things considered, the relative sales by different classes of dealers will either remain approximately as they now are or both department stores and central-station companies will show some increases, while the smaller electrical dealers will be a less important factor. This does not mean that the volume of sales by individual dealers will decrease, but it does mean that the better selling ability of department stores and the more energetic efforts of the central-station companies will result in their obtaining proportionally more of the business.

Study of Resonant Circuits

Analytical Treatment of Alternating-Current Circuit Containing Iron Core Reactance and Condenser in Parallel

By Dr. Lionel Fleischmann

If an air-reactance coil and a condenser are placed in parallel, the frequency of resonance is given by the relation $w^2 = 1/LC$, where L is the self-induction, C the capacity, $w = 2\pi f$ and f is the frequency. When a voltage of this frequency is impressed no current will flow in the line from the source of supply to the resonating system. The question is, will this also be true in the case of a reactance containing iron?

The magnetization curve, neglecting losses, can be represented by an expression $i = aB + bB^3$, in which i signifies the direct-current magnetizing current and B the flux, a and b being constants. For the purposes in hand this representation will be close enough.

Assuming an emf. of cosine wave form, the flux in the reactance coil must be of sine wave shape, and the instantaneous current in the reactance coil is:

$$i_R = aB_0 \sin wt + b(B_0 \sin wt)^3,$$

B_0 being the maximum value of flux.

The current in the condenser with a capacity equal to C is $i_C = -w^2CB_0 \sin wt$. The emf., e, is $-dB/dt$ and the current in the condenser is $Cde/dt = -w^2CB_0 \sin wt = i_C$.

The line current being the sum of the two,

$i_C + i_R = aB_0 \sin wt + b(B_0 \sin wt)^3 - w^2CB_0 \sin wt.$

This is the instantaneous value, but as instruments usually give the effective value this may be calculated by substituting:

$$(\sin wt)^3 = -\sin \frac{3wt}{4} + \frac{3}{4} \sin wt.$$

Then

$$i_R + i_C = aB_0 \sin wt + b\left(-\sin \frac{3wt}{4} + \frac{3}{4} \sin wt\right) B_0^3 - w^2CB_0 \sin wt,$$

or

$$i_R + i_C = \left(aB_0 - w^2CB_0 + \frac{3}{4} bB_0^3\right) \sin wt - \frac{bB_0^3}{4} \sin 3wt.$$

The effective current I will then be:

$$I = \sqrt{\frac{1}{2}} \sqrt{(a - w^2C + \frac{3}{4} bB_0^2)^2 B_0^2 + \frac{C^2}{16} B_0^6}$$

$$I = \frac{B_0}{\sqrt{2}} \sqrt{(a - w^2C)^2 + \frac{3}{2}(a - w^2C)\, bB_0^2 + \frac{5}{8} b^2B_0^4}$$

It is easily seen that this expression will vanish when B_0 is equal to zero or has an imaginary value. That is to say, with an iron-core reactance true resonance can never occur. But there exists a minimum current for every flux and, thereby, for every voltage with a given frequency. To find this relation, differentiate

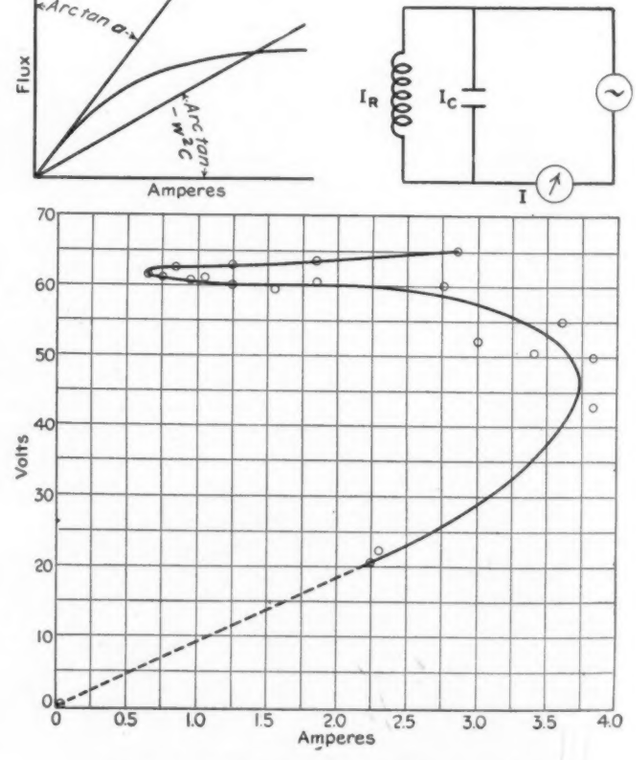
$$(a - w^2C)^2 + \frac{3}{2}(a - w^2C)\, bB_0^2 + \frac{5}{8} b^2B_0^4$$

with regard to B_0 and obtain:

$$\frac{3}{2}(a - w^2C)b + \frac{5}{4} b^2B_0^2 = 0,$$

$$B_0^2 = -\frac{6}{5} \frac{(a - w^2C)}{b}.$$

This is now the resonance formula, if it is desired to call it so. It is apparent that a minimum can only



CIRCUIT DIAGRAM, MAGNETIZATION CURVE AND RESONANCE CURVE

exist if $(a - w^2C)$ is negative. This is easily interpreted; a is the tangent of the magnetization curve at the origin. If a minimum value is to exist, the line showing the current taken by the condenser must fall within the magnetization curve. It can furthermore be deduced that to the same current I various fluxes, B, and consequently various voltages are co-ordinated. The equation

$$(a - w^2C)B^2 + \frac{3}{2}(a - w^2C)bB^4 + \frac{5}{8}b^2B^6 = 2I^2_m$$

solved for B^2 possesses under circumstances three real roots or one real root and two imaginary ones.

The curve shows values obtained by test and proves that the theory and facts are in accord.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Electric Range Metering

To the Editors of the ELECTRICAL WORLD:

The writer has been interested by the article in the ELECTRICAL WORLD for February 9 by William Quandt relative to the merits of metering electric range loads with three-wire, single-phase or polyphase meters. In presenting his material the author stated that he used an exaggerated case to emphasize his point.

Although the plan of using polyphase meters on range loads undoubtedly has some merits, I do not believe that such metering is to be advocated on a large or even a moderate scale. In the first place, domestic electric ranges are so wired by the manufacturers that an unbalanced load such as Mr. Quandt shows is impossible. A possible unbalance of such proportions would deprive the manufacturers of the range of the approval of the Underwriters' Laboratory, which approval is essential to make the product readily salable and allow of its connection on most companies' lines.

When a three-wire, single-phase circuit is unbalanced in respect to voltage to the extent of having 110 volts on one side and 120 volts on the other, the right procedure to apply corrective measures would appear to lie in the proper balancing of load on the particular transformer involved or a better arrangement of its secondaries, and not in the introduction of a polyphase meter on the consumer's premises to take care of the range load. On the assumption that other lighting customers are served from the same transformer as the range load, with an unbalance such as pictured, it would appear that in different parts of the same building, or on the premises of customers adjoining or opposite each other, two lamps of different voltage should be used to enable the customers to obtain maximum lighting efficiency. If any central-station company endeavors to supply both 110-volt and 220-volt service, it should be able to come closer to doing so than by furnishing 110, 120 and 230 volts, and probably some other values below, above and between these, from the same transformer. With the application of proper remedies for voltage unbalance, the necessity for providing more accurate metering of ranges or other three-wire, single-phase loads is practically eliminated.

Mr. Quandt has probably overlooked the difference in first cost as well as in maintenance cost of polyphase meters as compared with three-wire, single-phase meters, besides other factors generally entering into electric range load. A polyphase meter today costs more than twice as much as a three-wire, single-phase meter of the same capacity, to say nothing of the difference in delivery and installation expense. Meter manufacturers do not carry any appreciable stock of 110-volt polyphase meters. As most state regulatory bodies have rules covering the periodic testing of meters, it is invariably found that such rules call for more frequent testing of polyphase meters than of single-phase meters. This item alone would bring up meter maintenance expense on electric range loads were polyphase meters extensively used.

Regarding electric range load in general, the writer has made observations that prove that most companies which have a considerable amount of this type of business have for various reasons encouraged it by putting into effect rates that make the use of ranges attractive to their customers. Some such rates, adopted where gas is a strong competitor, barely cover the cost of giving service now. Should a company proceed to increase the cost of furnishing range service by using a more expensive meter, and probably no more accurate in most cases, with the higher maintenance cost attendant, the added expense would eventually be reflected in the rates for such service.

As to the theft of energy which is referred to in Mr. Quandt's article, I would say that with the proper use of meter protective devices such as most companies require this possibility can be eliminated. As most companies require customers to furnish such devices as part of their own installations, their cost should be of little concern to the companies except that it would be unfair for them to require polyphase devices when single-phase would suffice. Furthermore, a case of theft such as that described would be easily detected by an observing meter reader or other company employee.

The author also takes a lot for granted when he assumes that the average customer is familiar enough with electric construction to pull the fuse that would stop the meter and not interfere with his service, also that the average customer would know that all his service was coming from only one side of the three-wire system. It must also be borne in mind that a range should be supplied with cartridge-type fuses and that the majority of users of electric ranges are women, who are not apt to play with such fuses. Furthermore, when a three-wire, single-phase circuit is balanced a neutral is unnecessary, and if a neutral fuse is removed when such a condition exists the polyphase 110-volt meter would prove more inaccurate than the three-wire, 220-volt, single-phase meter.

C. F. MATHES,
Electrical Meter Expert Board of Public Utility Commissioners of New Jersey.
Newark, N. J.

Not the Amsteg Station

Through an unfortunate error the plants shown on page 1308 of the issue for December 29 were labeled Amsteg. As a matter of fact, one of the photographs was of the Venaus plant of the Moncenisio Hydro-Electric Company in northern Italy and the other showed Moncenisio Lake, which supplies the Venaus plant. The unusual feature of the Venaus installation is a 1,000-m. drop of continuous three-tube penstock.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Miniature of 13.2-Kv. Lines Facilitates Dispatching

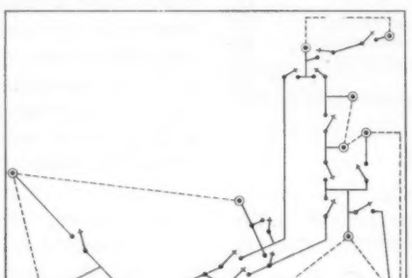
By L. G. Wainman

Distribution Department El Paso (Tex.) Electric Railway Company

SWITCHING and dispatching on the 13,200-volt, three-phase system of the El Paso Railway Company is facilitated by the device shown in the accompanying illustrations and developed by the writer. The dispatching board is a miniature model of the actual lines, with the exception that the actual lines are three-conductor, while the model has only a single conductor.

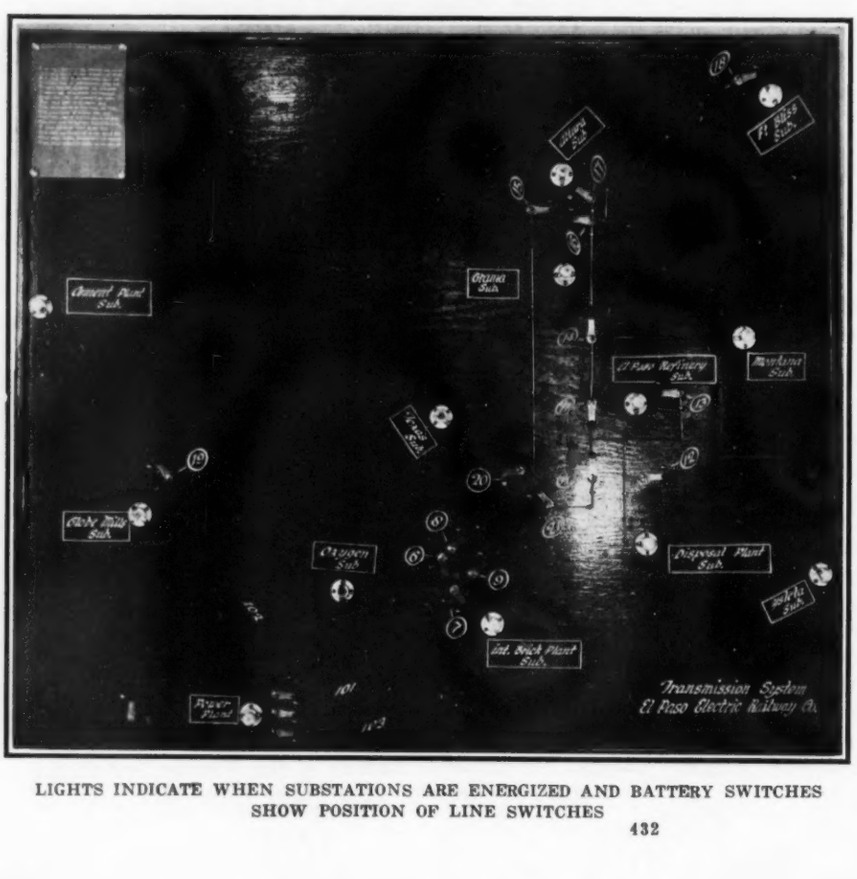
The line conductors are represented by a No. 18 bare copper wire soldered to the heads of brass wood screws. Pole top sectionalizing and tie switches are represented by small nickel-plated battery switches, and the substations are shown by miniature lights. The return circuits are on the back of the board. Energy is furnished by a 6-volt toy transformer, which may be replaced by a storage battery in case the supply to the transformer is interrupted.

Each switch on the model is left at all times in the position corresponding to its counterpart on the actual lines, so that the model always represents actual conditions.



WIRING DIAGRAM FOR DISPATCHING BOARD

Full lines indicate wires on face of board and dotted lines indicate return circuits on back of board.



LIGHTS INDICATE WHEN SUBSTATIONS ARE ENERGIZED AND BATTERY SWITCHES SHOW POSITION OF LINE SWITCHES

It has been found that this model is a considerable help to the dispatcher in visualizing what operations must be performed to clear up trouble by sectionalizing and to restore service by an alternate route where one is available. It was constructed to replace a pin map formerly used for dispatching, and, as indicated above, it has proved to be a very considerable improvement thereon.

It is realized that this arrangement might not be so satisfactory for some of the larger systems as the more elaborate boards in use, but it is a simple and inexpensive device which the smaller central stations can use where the expense and work of laying out a more elaborate board is not justified.

Shrink-Fitting a Heavy Shaft Assembly

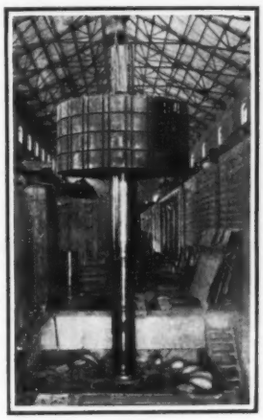
By A. T. Parsons

Pelton Water Wheel Company, San Franscisco, Cal.

WHEN installing the equipment for the hydro-electric plant of the Andhra Valley Power Supply Company near Bombay, India, an unusual method was developed for assembling the shaft, rotor and waterwheel runner by C. V. Foulds, field engineer for the Pelton Water Wheel Company of San Francisco. For the particular installation this method proved superior to the conventional press fit. The plant contains six 10,000-kva. General Electric generators, each driven by a single overhung Pelton impulse turbine. Only native labor was available, and this was mainly unskilled.

Each shaft assembly comprised four rotor spiders weighing 8 tons apiece, the waterwheel runner weighing 12 tons and the shaft itself weighing 9 tons—a total of 53 tons. The final assembly weighed 73 tons, but the twenty field poles for the rotor, weighing a ton each, were naturally not added until the rest of the assembly was completed. The bore of the runner and spider hubs was 0.003 in. smaller than the 22-in.-diameter shaft. Largely on ac-

count of the lack of skilled labor, it was decided to heat the spiders and runner by steam and shrink them on the shaft rather than employ the usual press-fitting methods. A steam-box large enough for one of the rotor spiders was constructed and a spider lowered into it. Steam



SUSPENDED SHAFT ABOUT TO BE LOWERED INTO STEAM BOX FOR FIRST SPIDER

was supplied by a donkey boiler outside the building. Four or five hours of steaming was required. This increased the diameter of the bore from 0.003 in. less than the shaft to 0.012 in. more. Further steaming made only a slight additional increase.

The first spider to be applied was necessarily the one next to the outboard bearing, so that in up-ending the shaft for insertion it was necessary to grip it by a friction clamp over the journal itself, as there was no collar to keep the clamp from slipping off. The clamp used was composed of two 12-in. x 12-in. teak timbers fitted to the curvature of the journal and held together by two pieces of 12-in. I-beam 3 ft. long with three 1½-in. bolts at each end. Forged links of 1½-in. steel were looped over the double hook of the crane.

For the first spider on each shaft a stop was attached to prevent the shaft going too far. The other spiders stopped against the ones already in place. After the first spider had shrunk in place the lifting clamp was removed and subsequent hoisting done with slings through the spider.

To guard against looseness in the main key and to insure alignment of the pole slots of the four spiders, a long key with one end tapered was made to exactly fit the slots, and as each pair of spiders came together it was inserted and left in place until the last spider to be added had cooled and gripped the shaft. The time of cooling was prolonged as much as possible, twelve hours usually being allowed, although the hub commenced to grip the shaft after one hour.

The shaft assembly, weighing 53 tons when completed, was suspended from the crane with the turbine runner down. An overhanging step was provided on one of the pit walls, on which the outer hub of the runner was rested, permitting the entire assembly to be lowered to a horizontal position without placing any weight on the buckets. The assembly was then picked up and set in the bearings.

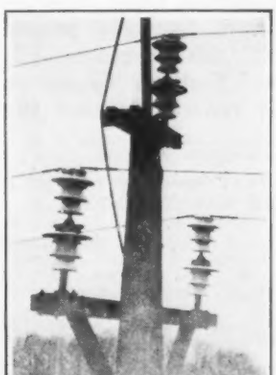
Reconstruction of 60-Kv. Transmission Tower Line

BY H. L. SHARP
Engineering Department Niagara, Lockport & Ontario Power Company, Buffalo, N. Y.

THE original high-tension transmission lines of this company were built and put in operation during the years 1905 and 1906. At that time the lines were among the pioneers operating at 60,000 volts. The best available construction was used, which consisted of single-circuit steel towers and wooden A-frames with the conductors arranged at the corners of an equilateral triangle. The wires of each circuit were all 7 ft. apart and were supported on the best pin-type insulators then available. All the main lines were built in duplicate in order to increase the reliability of service and to facilitate repairs when necessary.

On these early lines a great many interruptions to service were caused by insulator failures due to lightning. When pin-type insulators of better design became available the original insulators were removed and new ones were installed in their places. These changes extended over a number of years and the service on the lines improved with the changes. When the suspension type of insulator had demonstrated its superiority over the pin type it was decided to try to equip the existing lines with suspension-type insulators.

This involved considerable engineering difficulty, which was finally solved by the arrangement shown in the accompanying illustrations. Some of these show the remodeled towers side by side with the original pin-type towers and bring out clearly how the new supports were attached to the old towers. This construction has been in use for six years and has given entire satisfaction..



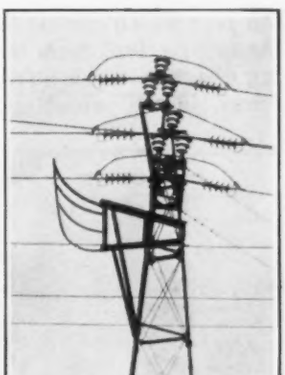
OLD AND NEW TYPE OF TRANSMISSION TOWER CONSTRUCTION

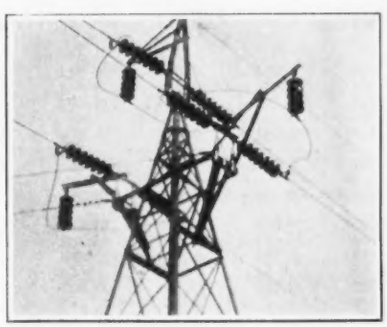
Upper left.—Tandem insulator arrangement required by limited clearance.

Lower left. — Reconstructed dead-end tower.

Upper right.—Reconstructed railroad crossing tower.

Lower right. — Double tower line with the older pin type insulator construction and the new suspension insulator arrangement.





The reinsulation of towers at railroad crossings differed from that of the standard strain towers as shown. Before attempting to make any changes on the crossing towers the proposed changes were submitted to the railroad companies and their approval was obtained.

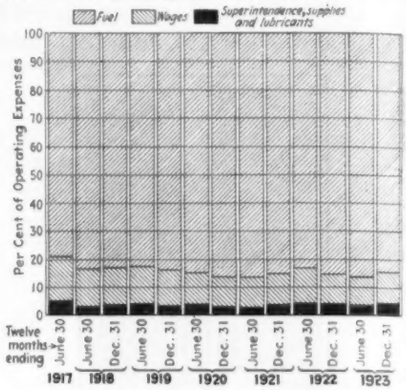
The advisability of the use of overhead ground wire on high-tension transmission lines has been widely discussed during recent years. On the earlier construction work a ⅜-in. galvanized Siemens-Martin steel ground wire was installed at the same time that the suspension insulators were installed. On the more recent construction the towers have been provided with supports for the ground wire, but the ground wire itself has not been installed. In several cases the two lines, one with ground wire and one without, are located on the same right-of-way for many miles, and it is hoped to secure some valuable data as to the benefits properly attributable to the ground wire.

On one section of the right-of-way the length of the cross-arms is limited to such an extent that suspension insulators could not be used and maintain satisfactory clearance to the sides of the wooden A-frames. In this case the insulation was improved by installing one pin-type insulator on top of another in "tandem" arrangement. An overhead ground wire was installed on this line at the time the tandem insulators were installed. This construction has been in use for six years on about 20 miles of line with 214,000-circ.mil and 556,500-circ.mil aluminum cable. It has given entire satisfaction as there has not been a single case of insulator failure on the line.

Production Expenses at Connors Creek

THE operating costs of the Connors Creek station for the twelve-month period ended Dec. 31, 1923, are again available through the courtesy of Alex Dow, president of the Detroit Edison Company. In commenting on the operation of this plant for the past year, Mr. Dow says:

"The one condition tending to improvement in thermal economy in 1923 has been the receipt of coal during the last six or seven months of the year which carried less ash than the fuel received from the same mining districts, or even from the same mines, in the preceding year. The greater cleanliness of the fuel is due, of course, to the fact that the mines have been seeking for business in 1923 instead of having business thrust upon them. We have been able to correlate a lot of observations on the effects of reduced ash content, and we know that the benefit is cumulative and not merely proportional to the increased amount of combustible per pound of coal. That is to say, the proportion of carbon which is carried away with the ash, unconsumed, increases as the percentage of ash increases. It might be noted that our figures do not show any reduced furnace efficiency, unless the ash is of such a character as to form clinkers and thereby make the fire uneven with dead spots and holes, but the increasing entrainment of good carbon with increasing ash which does not clinker is fully proved by actual tests.

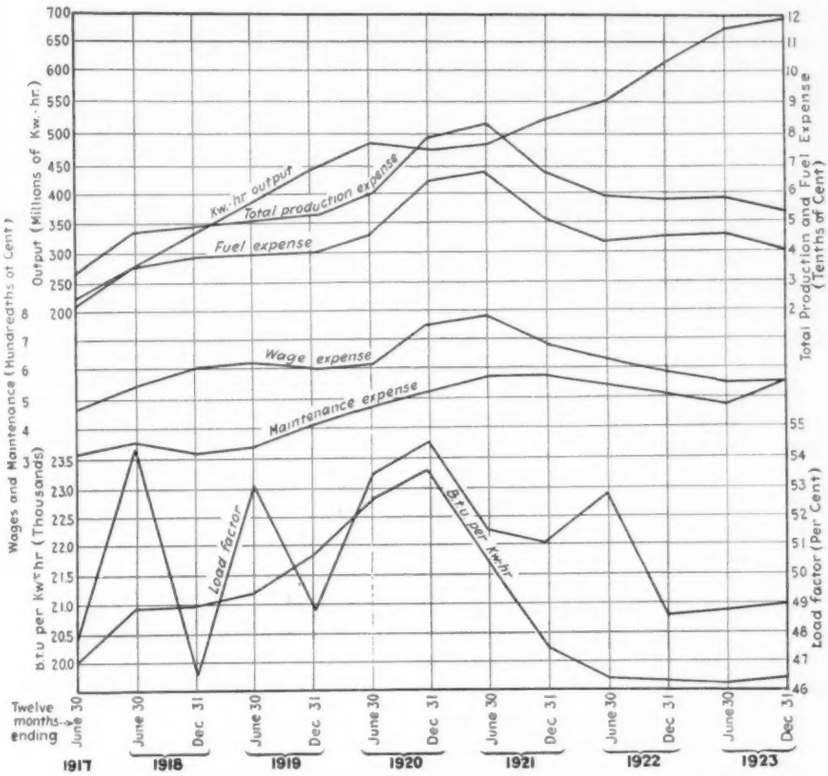


RELATION BETWEEN FUEL, WAGE AND SUPERINTENDENCE EXPENSES

"The higher thermal efficiency which we might have anticipated from the cause mentioned above was practically canceled by the countervailing fact that increased loads upon the Connors Creek plant entailed the operation of the boilers and turbines at points further along, and lower, on their characteristic efficiency curves. This was particularly the case with the boiler plant. Recurring and continuing loads of 150,000 kw. to 160,000 kw. meant that the fourteen boilers forming the total equipment at Connors Creek were worked well beyond the point of maximum efficiency for this particular combination of boiler, furnace and stoker, but with no economizers.

COMPARISON OF PRODUCTION EXPENSES PER KILOWATT-HOUR OF OUTPUT FOR CONNORS CREEK POWER HOUSE OF DETROIT EDISON COMPANY

	Twelve-Month Periods Ending										
	1917	1918	1919	1920		1921		1922		1923	
OPERATION:	June 30 Cents	June 30 Cents	June 30 Cents	June 30 Cents	Dec. 31 Cents	June 30 Cents	Dec. 31 Cents	June 30 Cents	Dec. 31 Cents	June 30 Cents	Dec. 31 Cents
Superintendence	0.010	0.009	0.010	0.010	0.012	0.015	0.014	0.013	0.012	0.011	0.011
Wages	0.047	0.055	0.062	0.062	0.076	0.079	0.609	0.065	0.058	0.055	0.055
Fuel	0.240	0.368	0.394	0.471	0.652	0.682	0.532	0.438	0.448	0.461	0.402
Water											
Lubricants	0.001	0.001	0.002	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Station supplies and expense	0.005	0.006	0.010	0.011	0.012	0.010	0.010	0.010	0.007	0.007	0.009
Total	0.303	0.439	0.478	0.555	0.754	0.788	0.627	0.527	0.526	0.535	0.478
MAINTENANCE:											
Station buildings	0.011	0.008	0.008	0.010	0.011	0.012	0.011	0.012	0.001	0.001	0.012
Steam equipment	0.019	0.025	0.024	0.036	0.038	0.043	0.045	0.041	0.037	0.035	0.040
Electrical equipment	0.001	0.002	0.001	0.001	0.003	0.003	0.002	0.002	0.004	0.003	0.003
Total	0.031	0.035	0.033	0.047	0.052	0.058	0.058	0.055	0.051	0.048	0.055
Total production expense	0.334	0.474	0.511	0.602	0.806	0.846	0.685	0.582	0.577	0.583	0.533
Output in kw.-hr.	210,039,700	280,814,700	383,252,000	488,060,600	479,425,900	485,189,500	527,121,200	555,896,300	613,263,100	676,907,100	695,874,700
Maximum demand in kw. (30-minute period)	50,000	59,000	82,000	104,000	100,000	107,500	118,000	120,000	144,500	158,500	159,000
Average load (kw.)	23,900	32,100	43,700	55,600	54,600	55,300	60,200	63,500	70,000	77,300	79,400
Load factor	0.478	0.544	0.533	0.534	0.546	0.515	0.510	0.529	0.485	0.488	0.499
Coal per kw.-hr. (lb.)	1.52	1.63	1.67	1.83	1.92	1.78	1.62	1.55	1.57	1.58	1.52
B.t.u. per kw.-hr.	20,040	20,930	21,200	22,800	23,300	21,800	20,250	19,700	19,660	19,600	19,700



TENDENCIES IN PRODUCTION EXPENSES, ECONOMY AND LOAD FACTOR AT THE CONNORS CREEK PLANT

"Comparison with the figures for the twelve-month periods ended June 30 and December 31, 1922, and June 30, 1923, leads to the conclusion that the Connors Creek plant as now equipped, with the fuel that is commercially the best available and with the load factor determined by the requirements of this industrial district, cannot be expected to improve its average thermal efficiency much above the present figure of 19,600 B.t.u. to 19,700 B.t.u. per net kilowatt-hour sent out at transmission voltage of 24,000. There is at the moment a reduction of efficiency in one turbine which has gone longest without overhauling. This reduction is presumably due to some erosion and to some leakage of steam between stages. But naturally, in a going plant, there will always be one turbine which is due for an overhaul and is under par for the time being, and there will always be some other minor sore spot that will prevent the possible efficiency of a perfectly new plant being averaged for twelve-month periods.

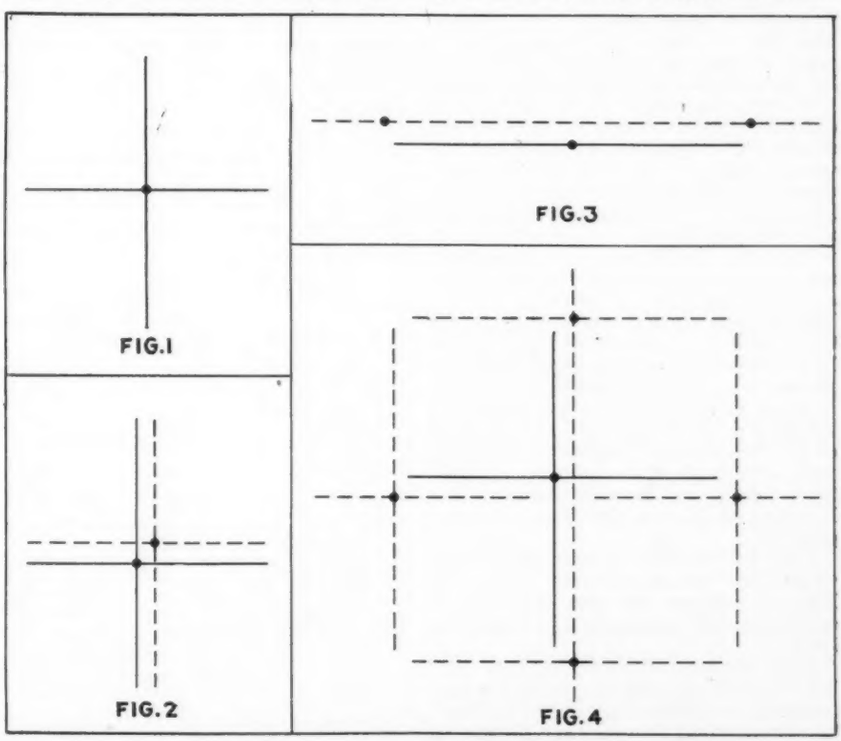
"There remains the possibility of change of equipment or method, and the obvious suggestion is that economizers might be installed. These should save at least 1,000 B.t.u. per kilowatt, and space was reserved for their installation in the original design. But even if it should appear that the investment and upkeep cost of economizers would be warranted, we could not make the change just now because we cannot spare even one pair of boilers from present duty long enough to make the installation.

"Excepting for this possibility of economizers, there is no change which could be made at Connors Creek toward increased thermal efficiency which would not increase other costs more than the possible gain in fuel costs. There are two or three hundred heat units still to be scraped up by minor changes which are being made, but these small economies will in most years be masked by some one or other of the minor and unavoidable inefficiencies of operation."

Duplicate Service Feeders in Congested Districts

BY C. G. WATSON
Pittsburgh, Pa.

WHERE consumers are many and load density is high it is advisable to provide an additional safeguard against failure of supply in the form of an alternative service to each consumer. Take the case of a feeder from which distributors radiate for supplying consumers' services, as shown in Fig. 1. The full black circle represents the feeding point and the heavy lines the distributors. As long as the feeder is sound it can be loaded to its full capacity; as soon as a fault develops the supply is totally interrupted, and until repairs are effected the consumers connected to that part of the system are without supply. When it



CIRCUIT ARRANGEMENTS FOR GIVING DUPLICATE SERVICE

is desired to give an alternative supply an arrangement such as that shown in Fig. 2 may be used. Here the full black circles have the same signification as before; the heavy lines represent one set of distributors and the dotted lines the other set. Each feeder will normally carry only half the total load, and when either breaks down the other will carry the full load. Thus, to give the alternative service requires twice the feeder copper required to give the simple service.

Another case is shown in Fig. 3, where the distributors on one side of a feeder mesh with half the distributors of another feeder, and the distributors on the other side of the first feeder mesh with half the distributors of a third feeder. Under normal working conditions, assuming that at any one time only one adjacent feeder will be out of commission, each feeder can be loaded to two-thirds of its capacity, and in the event of the breakdown of an adjacent feeder it will work at full capacity. To make this point quite clear, consider the middle feeder of Fig. 3. Let one-half of the load to the left of the feeding point be called A and the other half B; similarly, to the right, C and D. Of these loads, it is to be noted that A and D, being remote from the feeding point, are normally supplied by one or the other of the adjacent feeders and will only be thrown over to the feeder under consideration when their usual source of supply fails. Now, assuming the load to be evenly distributed, $A = B = C = D$. The maximum load that the feeder will have to carry will be either $A + B + C$, or $B + C + D$; in either case three-quarters of the total connected load. Of these three-quarters, two-thirds are normally connected, and in emergency the whole.

The case in which the distributors of a feeder mesh with the distributors of four other feeders is shown in Fig. 4. The normal load on each feeder is four-fifths of its full capacity, its total connections eight-fifths, its emergency load five-fifths, and only one and a quarter times the feeder copper of a simple service is required.

TABLE VII—GUYING AT ANGLES AND DEAD-ENDS

Conductors Wire		Size of Angle: 0 Deg. to 10 Deg. Guys Required		10 Deg. to 30 Deg. Guys Required		30 Deg. to 60 Deg. Guys Required		Line Terminal (Dead-End) Guys Required	
No.	Size	No.	Size, In.	No.	Size, In.	No.	Size, In.	No.	Size, In.
2	6	0	..	1	7/16	1	7/16	1	7/16
3	6	0	..	1	7/16	1	7/16	1	7/16
4	6	0	..	1	7/16	1	1/2	1	7/16
5	6	0	..	1	7/16	1	1/2	1	1/2
6	6	0	..	1	1/2	1	1/2	1	1/2
2	4	1	7/16	1	1/2	1	1/2	1	1/2
3	4	1	7/16	1	1/2	1	1/2	1	1/2
4	4	1	7/16	1	1/2	1	1/2	1	1/2
2	2	1	7/16	1	1/2	1	1/2	1	1/2
3	2	1	7/16	1	1/2	1	5/8	1	5/8
4	2	1	7/16	1	1/2	2	1/2	1	1/2
2	0	1	7/16	1	1/2	2	1/2	1	1/2
3	0	1	7/16	1	1/2	2	1/2	1	1/2
4	0	1	7/16	1	1/2	2	1/2	2	1/2
2	4/0	1	7/16	1	1/2	2	1/2	2	1/2
3	4/0	1	7/16	1	1/2	2	1/2	2	1/2
4	4/0	1	7/16	1	1/2	2	1/2	2	1/2

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Guying Distribution Poles

Guy Wire.—All ordinary guys shall be made of either ½-in. or 7/16-in galvanized Siemens-Martin seven-strand steel wire. Cross-arm guys shall, in general, be made of No. 6 galvanized-iron wire.

Where Required.—Guys shall be installed wherever the wires tend to pull a pole or cross-arm out of place and when installed shall take up all of the strain so that the pole will act merely as a strut. The only exception to this rule will be for angles up to 10 deg., when poles which carry not more than six No. 6 copper wires may be raked and straight-line construction used. Where the ground is not firm or where the strain is greater than that of six No. 6 wires, all angle poles shall be guyed as required in Table VII.

Guys shall be used in preference to braces wherever possible. For method of guying corner, buck-arm and angle poles see Table VII and Figs. 19 and 20. (The latter may be found in the ELECTRICAL WORLD for Feb. 23, 1924, page 387.

Poles in line running up a steep slope shall be head-guyed as shown in Fig. 21. Guys are also required at crossings over railroads and telephone lines.

Line Guying.—Where pole lines having few side taps are located in exposed territory one pole every 2,500 ft. shall be guyed four ways, as shown in Fig. 22.

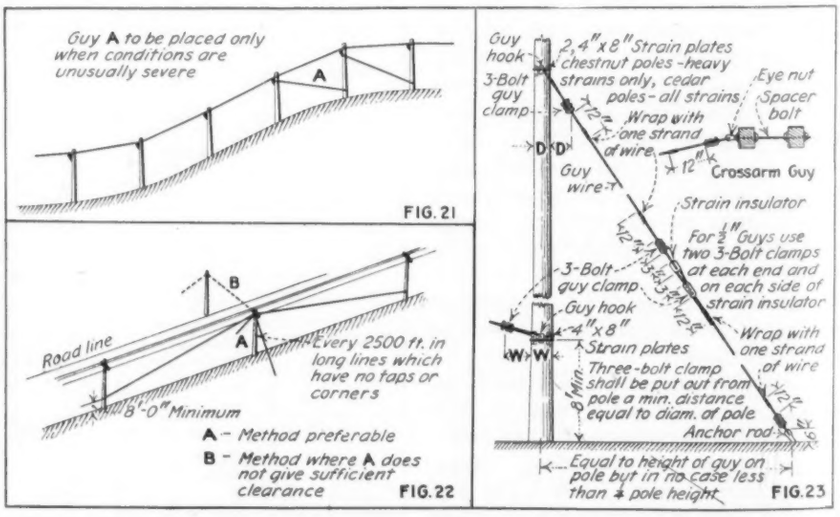
Terminal Poles.—Line terminal poles shall be guyed against the strain of dead-ended conductors (see Table VII), and in exceptionally heavy leads the pole next to the terminal pole shall be head-guyed in the same direction. Where the terminal pole cannot be guyed on account of some local condition, the strain may be taken up on the first or second pole from the end of the line. In that case the line should be dead-ended on such first or second pole and slack spans strung into the terminal pole. In this case the dead-end pole should be guyed, and if the line is heavy the next pole in the line should also be guyed against the strain. (See Fig. 19 in the ELECTRICAL WORLD for Feb. 23, 1924, page 387.

Poles which have two or more wires dead-ended on them shall be head-guyed to the next pole. Poles at which conductor size changes shall be guyed against the unbalanced strain.

Cross-Arm Guys.—Cross-arms which have more wires dead-ended on one end than on the other shall be guyed from the end carrying the greater strain to the next adjacent pole, ordinarily by means of No. 6 iron wire.

Guy Details.—Guys shall be erected in accordance with Fig. 23. The end of the guy wire shall project 12 in. past the clamps and be fastened to the guy wire by means of eight or ten wraps of one strand of the wire. Except where the guy is horizontal, two standard guy hooks shall be placed in the sides of the pole under the wire. Be sure that all three-bolt clamps are screwed up so that they will not slip.

Solid wire guy, if used, shall be fastened to a single cross-arm by wrapping twice around the cross-arm. Solid or stranded guys shall be fastened to double cross-arms as shown in Fig. 23.


Guy A to be placed only when conditions are unusually severe
A
FIG. 21
B
A
Road line
Every 2500 ft. in long lines which have no taps or corners
8'-0" Minimum
A - Method preferable
B - Method where A does not give sufficient clearance
FIG. 22
Guy hook
3-Bolt guy clamp
2,4" x 8" Strain plates chestnut poles - heavy strains only, cedar poles - all strains
Eye nut
Spacer bolt
12"
Wrap with one strand of wire
D
D
Guy wire
12"
Crossarm Guy
Strain insulator
For ½" Guys use two 3-Bolt clamps at each end and on each side of strain insulator
3-Bolt guy clamp
Guy hook
4" x 8"
Strain plates
W
W
Wrap with one strand of wire
Three-bolt clamp shall be put out from pole a min. distance equal to diam. of pole
8' Min.
Anchor rod
Equal to height of guy on pole but in no case less than ¼ pole height
FIG. 23

FIGS. 21 TO 23—HEAD GUYING UP HILL, LINE GUYING AND DETAILED METHOD OF POLE GUYING

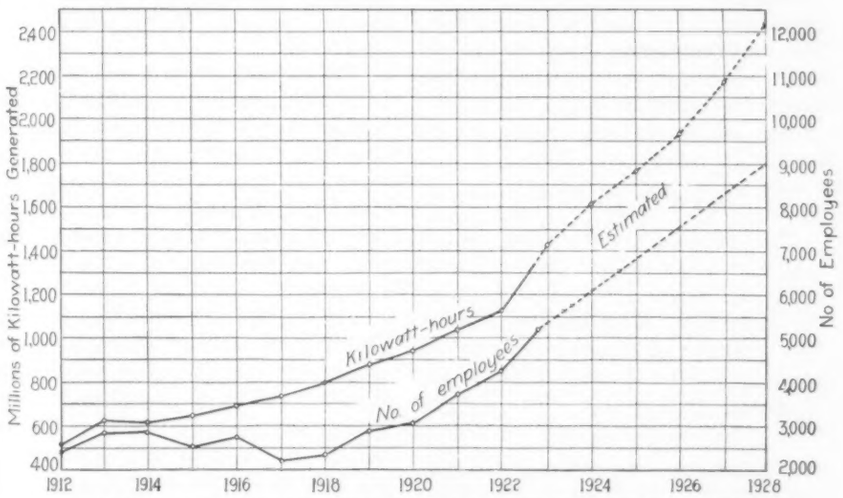
Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Chart Shows Future for Employees

CURVES have been made up by the Southern California Edison Company which show the relationship between the number of employees and the kilowatt-hour output year by year. From this graph, which is reproduced here, it will be seen that the number of employees increases about in direct proportion to the increase in generation.

At the present rate of increase the company's physical expansion will double in less than four years, and



COMPARISON OF KILOWATT-HOURS GENERATED AND PERMANENT EMPLOYEES

the industrial development of central and southern California has just begun. This means that an increasing number of employees will be needed to operate and maintain the system and to sell the additional energy. These conditions impose the necessity for a greater degree of executive ability. It is interesting to know that the ratio of superintendents and foremen to the total number of employees is that of one to eight. According to the curve there will be 9,000 permanent employees in 1928, and this means that 475 additional superintendents and foremen will be required.

It has thus been shown that there is a promising future ahead of Southern California Edison employees, and the company has put this question to them: "What are you doing to prepare yourself for one of these positions?"

Marking Meters Having a Constant Avoids Error

NEARLY all power companies occasionally find errors in billing because the proper notation has not been made on the meter connect order of the fact that the meter has a constant or multiplier. Such errors are seldom corrected by the meter reader because it is impossible for him to read the inscription "kilowatt-hours multiply by 10" from the same position that he reads the meter. Each time that a constant is missed it means a serious error in billing and a loss of revenue to the company.

The Pacific Power & Light Company, which serves a large number of communities in Oregon and Washington, conspicuously marks all meters having a constant by attaching a yellow tag which reads, "This meter has a constant." Such meters stand out from the rest, and if a man sets one of these meters without making a notation of the constant on the order it is plain carelessness. A check is being made of all meters in service and one of these tags is being attached to all of those having a constant. Meter seals are used for attaching the tags. Some companies accomplish the same thing by stenciling the constant "K-10" or "K-100" in white letters on the meter cover.

Practical Publicity Methods for a Public Utility

IN DISSEMINATING for publication in the daily papers news of its activities the Buffalo General Electric Company has adopted an open-door policy which has won the confidence of local newspaper men and gained for the company a fair presentation in the press for its side of any question. Three primary tests or considerations are given to all of the Buffalo company's publicity work: First, is it ethical? Second, if ethical, where shall the line be drawn between news and publicity puffs? Third, is it advisable for a public service corporation to divulge information concerning its affairs for the unrestricted use of the newspapers?

The Buffalo General Electric Company believes that real news of interest to the public is happening all the time in its daily transaction of business and that it is a perfectly ethical function of its publicity department to see that the newspapers of the city are kept in touch with such news.

The test of whether the news item has general-reader interests or is something that would simply serve to advertise the company and its service to the public helps determine where to draw the line between legitimate news matter and publicity puffs.

The company has found by experience that once the newspaper editors have acquired confidence in the corporation's publicity department they can be depended on to handle all news items discreetly and not to distort facts as given out by the publicity department.

This last point, the building up of

confidence in the editorial mind, involves conscientious and patient work on the part of the publicity man. A. W. Park, publicity director of the Buffalo General Electric Company, describes his methods as follows:

"We endeavor to maintain the most cordial personal relations with the newspapers so that whenever an editor hears of some news connected with the electrical industry he will call us up and get our views or our side of the question. We do not 'kick' when we are criticised, provided the newspaper prints our side at the same time. The result of this policy has been to prevent publication of misinformation regarding company affairs and to make sure that the facts appear in print.

"The Buffalo General Electric Company gives out nothing that is without news value. We do not send puffs or propaganda to the editors. When we have a matter for public print in which we are more interested than the public we buy advertising space for it. All information for publication is given out through the publicity department, so that the various city editors have learned whom to call and where to call for any information regarding company affairs. When a request for information comes every effort is made to dig out the facts sought and get them to the newspaper in the shortest possible time.

"When we know we have news we write it for the newspapers in a condensed form that the editors appreciate and give it to each newspaper impartially. When a news writer comes to us on an assignment for his newspaper we give him all the information we can and do not betray his confidence to his rivals.

"We work on the principle that we have nothing to conceal and that the people are entitled to any and all information concerning our company and its operations that may interest them."

The activities of the Buffalo General Electric Company in this direction are wide and varied. The company prepares monthly diagrams for the newspapers showing its curve of electrical generation compared with the curve for the same month of the previous year, a service that the business editors of the papers appreciate as showing the city's business progress from year to year. The company has photographs made from the news viewpoint whenever new construction is under way, and these are given to any editors who can use them, together with concise news material to accompany them.

During 1923 there was printed in the Buffalo dailies 11,095 agate lines of current news furnished by the publicity department. In addition papers and magazines outside of the daily newspaper field printed 1,257 column-inches of matter, or approximately 63 columns pertaining to the public utility business.

San Francisco Store-Lighting Campaign

Central Station, Jobbers and Contractors Co-operate in Selling 268 Better Lighting Jobs—$1,756 Added to Monthly Revenue of Power Company

A VERY successful store and window lighting campaign was conducted in San Francisco during the latter part of 1923 by the Pacific Gas & Electric Company in co-operation with five jobbers and eighteen contractor-dealers. It was arranged that the power company should manage the campaign and furnish five salesmen, each of whom represented a jobber. The jobber assisted in training the salesman and furnished literature and sample equipment. The contractor-dealer estimated the jobs and installed the equipment which the salesman sold. The results of the campaign are shown in the tabulation below.

PLAN OF CAMPAIGN

The campaign was scheduled to last for a period of twelve weeks with two weeks devoted to training the salesmen. One week was given over entirely to school work and one week to practical application of the principles in the field. The general plan of the campaign was as follows:

1. Select five experts from the lighting industry to act as an advisory board in training salesmen and giving them technical information when required.
2. Survey the smaller stores in San Francisco and list 1,500 having poor window or interior illumination which would provide good field for a better lighting installation.
3. Employ five men adapted for selling illumination.
4. Establish a school and outline a course in illumination sufficient to enable these men to sell better lighting methods and proper equipment.
5. Print two series of sales letters, 1,500 of each series, on power company stationery.
6. Print 1,500 prospect forms to be given to the salesmen with the prospective customer listed and a space for the additional information to be gathered.
7. Divide the city into business districts for the purpose of systematic work by the salesmen.
8. Devise a systematic method of directing the salesmen's activities and keeping records of "prospects" and "follow-ups."

The advisory board was composed of an illuminating engineer from the Edison Lamp Works, one from the National Lamp Works and a representative each of the Westinghouse Electric & Manufacturing Company, the National X-Ray Reflector Company and the Pacific Gas & Electric Company.

The survey of the stores involved the visiting of nearly three thousand stores and the listing of fifteen hundred of the best prospects. It required the time of two men for two weeks to complete this survey. As the city is composed of a number of shopping districts, each of these was made into a district for the purpose of the survey and to facilitate keeping records and handling the salesmen. In this way it is estimated that 95 per cent of the stores in the city were covered.

DATA ON BUSINESS GAINED IN SAN FRANCISCO LIGHTING CAMPAIGN

Number of stores surveyed	2,404
Number called upon and to whom sales talk was made	1,367
Number of better lighting installations sold	268
Total sales:	
Fixtures	$12,669
Wiring	8,220
Lamps	2,777
Total	$23,666
Business gained:	
Total additional connected load	274 kw.
Estimated additional monthly revenue	$1,756

SELECTION AND TRAINING OF SALESMEN

The selection of salesmen was one of the most important matters. A large list was sifted until the available material was exhausted. The personnel department of the power company first interviewed the men who answered the advertisement and then weeded out the unfit and passed along the eligibles to another department for interview. This was repeated with four different persons, and upon final comparison it was found that the same four men had

been selected. In order to eliminate any partiality these men were assigned by lot to represent the manufacturer's line as handled by the jobbers.

A course of lectures and a training program was outlined, and suitable quarters were selected for the salesmen's meetings. The room was furnished with a telephone, desks and chairs and a large drawing table. A blackboard was provided for the use of the instructors. Typical specimens of interior and window lighting equipment were hung in this room for practical demonstration of correct lighting methods.

The training itself consisted of a series of lectures and demonstrations, together with practical application. Various manufacturers' technical data and bulletins were used as textbooks. The National and Edison bulletins on illumination design and on store lighting were used as well as the material of the Illuminating Engineering Society.

The week of intensive training produced excellent results as evidenced by the initial sales talks in the class and the men's selling talk to the first prospects. Their first calls were at small groceries and markets, where it was felt they would meet with the greatest resistance and that this would fit them better for their work with the more important stores in the busier sections. It proved a good practice ground for the second week of the training period.

METHOD OF HANDLING CAMPAIGN

The method of prosecuting the campaign as outlined by the advisory board was briefly as follows:

1. Secure and list the prospect on form provided.
2. Write two strong sales letters to prospect one week previous to salesman's call.
3. Give five prospects per day to salesman in addition to follow-up cards.
4. Let salesman interview manager of the concern, representing the power company as a lighting expert giving service to the customer.
5. Survey store lighting and record information on the form. If considered a good prospect, a sketch to be made and the date for the next call noted.
6. Design a proper lighting system and obtain a bid for the installation from one of the co-operative contractor-dealers.
7. Present the plan and bid and help dealer close sale of equipment.
8. Render a complete report each week of all prospects and the amount of merchandise sold.

If the outlook was at all promising, a survey of the lighting was made and its intensity noted with a portable photometer. This was not only impressive to the merchant but gave him surprising information about his lighting which no amount of sales talk could have done. A sketch was made on the survey card and a design drawn up later for that particular store, after which a contractor was asked to bid on the specifications prepared. Some of these bids were rejected and some accepted in part, but the salesman seldom misjudged the real intention of a prospect and did not cause the contractor much useless work. In cases where customers had their own contractors whom they would insist on engaging to do the work they were, of course, at liberty to engage them.

In checking up on the stores after better store or window lighting had been installed the owners and managers were enthusiastic over the results and many letters were received telling of the benefits derived from the new lighting scheme. In general the campaign is regarded as a distinct success and has paved the way for other store owners to improve their lighting systems. It has also shown the contractor-dealer that the business is there if he only goes after it.

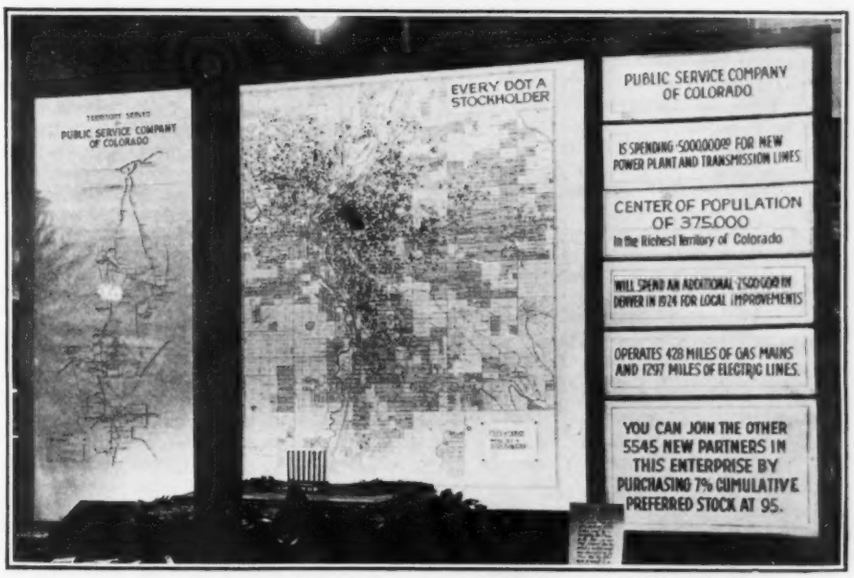
A Customer-Ownership Map Display

AS PART of a customer-ownership campaign the Public Service Company of Colorado recently used the window display which is shown here. In November the company opened a stock-selling drive in which employees acted as salesmen and upward of 5,000 customers have so far been enrolled as stockholders. The window display used for a background a large map dotted with red tacks, each indicating a stockholder. Cards were suspended along one side of the map telling briefly the features of the company's business and why its stock was an attractive investment.

What Other Companies Are Doing

Medford, Ore.—The employees of the California Oregon Power Company have an educational program which includes three courses, one on the fundamentals of business management, one on hydro-electric engineering and one in psychology. Two of the classes are conducted by officials of the company and the other by a college professor. The members of the classes bear the expense of conducting them.

Delavan, Wis.—The increased use of electricity in this city for washing, ironing, cleaning, cooking and numerous other purposes by customers of the Southern Wisconsin Electric Company, resulting in increased revenues and lower operating expenses, has made it possible for this company to make a 1-cent reduction per kilowatt-hour in rates affecting all light and small power customers. This reduction will mean an annual saving of approximately 5 per cent to the customers using the company's service. It is the fourth voluntary reduction that this company has made in its electric rates since January 1, 1922.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Hydro-Electric Development and Steam Equipment

Methods of Storing Coal.—There is a prevailing impression that while coal-handling and coal-storing machines are economical for large plants, the small plant must stick to hand shoveling. The article discusses several low-priced systems with the object of proving that coal-handling machines are not limited to large plants.—*Power*, Jan. 15, 1924.

Constant-Potential Dynamo for Variable Speed.—If a small series motor is fastened to the shaft of a compound-wound generator and is connected in series with the shunt winding of the generator, the latter will give a constant voltage at variable speed. Such a system has been suggested and patented by Marius Latour. The inventor simplified the arrangement by combining the motor with the generator, placing two auxiliary brushes upon the commutator of the generator and providing an auxiliary magnetic field on the stator. By short-circuiting or partial shunting of the latter the voltage of the machine can be raised, so that a floating storage battery can be fully charged. To maintain the same terminal polarity the current has to be reversed in the windings in case of opposite drive.—*Revue Générale de l'Electricité*, Jan. 19, 1924.

Wood-Stave Penstocks.—H. RABOVSKY.—Representing as it does a high percentage of the total installation cost of a hydro-electric plant, the steel penstock may frequently be replaced by a much cheaper wood-stave pipe line. Up to a diameter of 25 in. ready-made wooden pipes about 36 ft. in length can be obtained and shipped from the factories. Penstocks of larger diameter are assembled in place from specially shaped wooden pieces. As a rule these pipes are for hydraulic pressures not exceeding 15 atmospheres. The internal friction in these pipes decreases with time, as their inside surface becomes covered with a slimy sediment. Steel pipes, on the contrary, corrode and become rough on their inside. Pipes of small diameter should be placed in the ground. Curves in the penstock should be of a radius at least a hundred times the diameter.—*Der Elektrische Betrieb*, Jan. 24, 1924.

Generation, Control, Switching and Protection

Calculation of Forces on Reactance Coils.—J. HAK.—The exact calculation of the mechanical forces to which reactors are subjected in normal service and during short circuits is very difficult and uncertain. If, however, somewhat limiting assumptions are made, very simple approximate formulas may be established which lead to the forces sought. The author starts his derivations from the forces in a single-ring conductor, as given in the equation by Rayleigh. If the reactor has several turns, the forces upon the turns will tend to enlarge their diameter and at the same time to repel each other, which will result in as many different directions of these forces as there are turns, and their calculation would accordingly be very complex. The author, therefore, substitutes for the many conductors a single one so placed as to give the same inductivity, and he assumes a radial force acting upon this ring equal to the resultant force of all the individual turns which it replaces. Introducing the shape of the coil by the relation between its height, depth and diameter, further approaches are made, until finally Korndörfer's inductance formula furnishes the desired force. A coil of 0.58 millihenries, with a diameter of 34 in., carrying 1,500 amp. at 50 cycles, shows a force of 510 lb., or 63 lb. for each of its eight supports. At seven times normal current this force per support becomes 3,100 lb.—*Elektrotechnik und Maschinenbau*, Jan. 13, 1924.

Advances in Design, Manufacturing and Testing of Static Condensers in Power Sizes.—R. E. MARBURY.—Static condensers which have been designed with insulation factors of safety such as have proved dependable in other apparatus are described. These ratios have been maintained and the product still kept on a reasonable commercial basis by increased economy in construction and use of material and by accurate check of insulation quality in every unit.—*Journal of A. I. E. E.*, February, 1924.

Transmission, Substations and Distribution

Design, Construction and Preliminary Test of Three-Phase Artificial Transmission Line.—S. BEKKU.—Details of the three-phase artificial transmission line built at the electrotechnical laboratory in Japan are fully given. The electrostatic and electromagnetic requirements to represent the three-phase transmission line are discussed, special endeavor being paid to the electromagnetic property.—*Journal of Institute of Electrical Engineers of Japan*, November, 1923.

Interconnection, Superpower and Electrification.—S. Q. HAYES.—Three closely related features—interconnection, superpower and electrification—taken individually and collectively, are probably the most important electrical matters now in the process of development and expansion or under consideration by those responsible for progress in the electrical field. Owing to the breadth of the subject, the author confines himself largely to the more important aspects of the problems, considering each of the three in a broad way and giving a few particular details by way of illustration. He also gives a general descriptive definition of interconnection, superpower and electrification, the benefits arising from their use, typical examples, both domestic and foreign, and some general conclusions as to the advantages to be gained by properly combining these developments.—*Electric Journal*, February, 1924.

Units, Measurements and Instruments

Measurements of Mechanical Constants of Electrical Meters.—Y. WATANABE.—The study of the determination of mechanical constants of electrical measuring instruments by various applications of extra-low-frequency electromotive-force methods. Test results are given for the instruments of the moving coil, moving iron, electrodynamometer and hot-wire types. It was ascertained that the measuring instruments generally have natural frequencies less than two to three cycles per second, and that many of them have insufficient damping effect. Hystersis phenomena were observed for instruments of the permanent magnet type.—*Journal of Institute of Electrical Engineers of Japan*, November, 1923.

Continuous Power-Plant Testing.—THEODORE MAYNZ.—The author discusses how the efficiency of a boiler plant can be found each day, with examples of the necessary log data together with the simple process of making the calculations. Charts for determining the efficiency of plants are given.—*Power*, Feb. 5, 1924.

Meter Connections for Three-Phase Lines.—R. DEHRMANN.—Unsymmetrically loaded phases on three-phase lines require two meters to give the actual energy consumption. Connecting these into the lines, particularly if current and potential transformers have to be interposed, results in a large number of possible wrong connections, which lead to faulty readings. It is the object of this paper to explain the correct ways of wiring the meters and methods for checking up meters already wired. In many installations otherwise correctly connected meters give very inaccurate readings, which is due to an improper selection of the instrument-transformer type, which should always be as nearly as possible fully loaded. The use of a 1,000-amp. current transformer for a meter in a circuit which does not carry more than 400 amp. will give very inaccurate readings. Similar results are caused by potential transformers of improper ratio. A tabulation of eighteen characteristic misconnections given in the article shows what the meters read instead of the correct value.—*Elektrische Betrieb*, Jan. 10, 1924.

Illumination

Comparison of Artificial and Natural Daylight.—P. R. ORD.—The author shows by the aid of the Nutting-Hilger spectro-photometer that the spectra of two illuminants or any illuminant and daylight should be compared color by color and the excess or deficiency in each case fixed. One difficulty encountered, however, is that daylight itself

is not a constant value, but varies greatly, both in intensity and quantity. It appears that the departure of some forms of artificial daylight from natural light is much greater than the usual variations in daylight itself. The best types of artificial daylight units, on the other hand, appear to approach the limits of possible accuracy. The relation of illumination intensity is also considered. — *Illuminating Engineer (England)*, Vol. XVI, No. 7.

Progress in the Art of Illumination. —ALEXANDER BISHOFF. — The author sets forth the progress made in electrical illumination from 1900 to July, 1923, as evidenced by the number of patents granted by the United States Patent Office. A brief discussion of the more active branches in the art of illumination is given to indicate the trend of thought followed by inventors in solving the many problems presented in this art. The total number of patents granted in the United States as well as in foreign countries on devices relating to illumination is included.—*Transactions of I. E. S.*, January, 1924.

Motors and Control

Circle Diagram of Polyphase Induction Motors.—H. HO.—It is shown that the exact circle diagram of a polyphase induction motor can be derived in a simple and easy manner of applying, for its solution, the principle of superposition of currents.—*Journal of Institute of Electrical Engineers of Japan*, November, 1923.

Losses in Synchronous Machines.—R. RÜDENBERG.—For lack of suitable methods the influence of the so-called additional losses in synchronous machines has not been considered heretofore when their efficiency was calculated. Such losses originate in eddies in various parts of the machine. Parasitic stray fields are set up in the machines, particularly in the air gap, the coil ends and their surroundings, which the author investigates as to their exact location and magnitude. It is shown that these losses represent the major part of the additional losses. These losses are negligible at or near unity power factor, but become considerable with increasing phase angle. New formulas are given to determine their magnitude, and on a great many practical measurements in actual service their accuracy is shown. The author demonstrates that the additional losses may be measured with great exactness by a short-circuit test of the finished machine. So suitable is this method that it has been incorporated in the recently adopted German machine rulings.—*Elektrotechnische Zeitschrift*, Jan. 17, 1924.

Recent Electrical Equipment.—A. J. WHITCOMB.—The author describes new equipment for industrial use brought out during 1923, with new applications of standard types of interest to men responsible for plant operation from production and maintenance standpoints. Industrial motors and motor drive, control equipment, substation equipment, industrial heating, repair shop tools and supplies are among the subjects covered.—*Industrial Engineer*, February, 1924.

Heat Applications and Material Handling

Iron and Steel Mill Furnaces. — A mill described operates two electric blast furnaces for the production of pig iron from iron ores, each of 2,700-kw. capacity. Three-phase current of from 50 volts to 100 volts at 25 cycles is supplied to their six carbon electrodes. For one ton of pig iron 2,500 kw.-hr., 5.3 kg. of electrodes and 22 kg. of charcoal is required. These two furnaces have produced a total of 90,000,000 tons of pig iron in six months. For refining purposes one 2,400-kw. and two 650-kw. arc furnaces are provided. The 10,000-volt, 25-cycle, three-phase supply current is transformed for the large furnace to from 60-volt to 90-volt, two-phase current, while the two small furnaces are operated single-phase.—*Elektrische Betrieb*, Jan. 10, 1924.

Precision Arc Welding.—S. W. MANN. —Numerous welding repairs that have been accomplished with a very great saving in both time and money and in which very accurate arc welding work was involved are described. It is now possible, through the use of precision instruments that are capable of measuring the alignment of a shaft assembled in an engine frame, and with the electric arc process, to repair or straighten a broken or twisted shaft or a broken casting to the same degree of strength and accuracy that is required by the manufacturer.—*Journal of the American Welding Society*, January, 1924.

Electrophysics, Electrochemistry and Batteries

Influence of the Shape of Permanent Magnets Upon Their Residual Magnetism.—A. MICHEL and L. VEYRET.—The authors have undertaken an elaborate investigation to determine how the shape of a horseshoe-type permanent magnet affects the intensity of its residual magnetism. The girth, cross-section and center distance of the magnet legs and the height of the magnet were taken into consideration. It was found that geometrically similar magnets are of about equal strength. A simple formula is derived for calculating the intensity of the flux in horseshoe magnets, and it is claimed that this formula comes within 10 per cent of actually measured values. Considerably stronger permanent magnets may be built if cobalt-steel alloy is used instead of the customary tungsten steel.—*Revue Générale de l'Electricité*, Jan. 12, 1924.

Action of Radium on Storage Batteries.—M. HARTENHEIM.—In co-operation with the Standard Chemical Company, the author has investigated the influence that an addition of a radioactive substance to plates, electrolyte or spacers has upon the characteristics of storage-battery cells. An admixture of the radio-active salt to the electrolyte is useless, as it is being changed into insoluble $RaSO_4$. Appreciable results were obtained by impregnating the wooden plate separators with the salt, using 0.00001 gram of radium in the separators of a cell. Noticeable difference between the treated and untreated cells was found only during heavy overloads. On starter batteries for automobiles tests were made with short heavy overloads giving 18 per cent to 61 per cent increased capacities. Best results were obtained with plate separators woven of specially fine glass threads, the radioactive material being in alloy with the glass. A point of diminished returns has been found beyond which a further increase of the amount of the radioactive material causes a decrease of capacity. The short life of the separators and the too high cost of the radium do not seem to make this process promising.—*Elektrotechnische Zeitschrift*, Jan. 17, 1924.

Traction

Reducing Noise in Train Operation. —In an extended series of tests the Electric Railways of London, Ltd., have developed methods of preventing noise from entering the cars in their underground system. Sound-absorbing material placed in roof, walls and floor, heavy closed windows, special ventilators and shrouding of trucks are features incorporated in the cars.—*Electric Railway Journal*, Jan. 26, 1924.

Electric Locomotives for the Imperial Japanese Railways. — An important railway electrification program is being carried out on the government railways of Japan. A total of thirty-six electric locomotives have been supplied by one English manufacturer. Eight of these are of the 4-6-6-4 type, while the remaining are of the 0-4-4-0 type. A potential of 1,500 volts direct current is used for the trolley, while the motors are rated at 750 volts each, two motors being used in series. A detailed description of these locomotives and of the more important features incorporated in their design is given.—*Engineering (England)*, Jan. 25, 1924.

Telegraphy, Telephony, Radio and Signals

Carrier-Current Telephony on the High-Voltage Transmission Lines. — J. A. KOONTZ. — The author gives a brief description of the power circuits and radio equipment used in the carrier-current system of the Great Western Power Company. The method of calling employed and the use of this system as a trouble detector and recorder of switch operation is also considered.—*Journal of A. I. E. E.*, February, 1924.

Voltage Amplification Ratio of the Triode Valve Resistance Amplifier.— H. NUKIYAMA and T. KUWASHIMA.— The relation between the amplification ratio and the resistance in the plate circuit and the amplitude of the impressed alternating voltage at the grid is studied experimentally. It is observed that in the amplifier, which has a grid condenser, the grid average voltage is affected to a great extent by the input-grid alternating potential due to the rectifying action, and this will cause the change of the amplification ratio by the change of the amplitude of the input-grid alternating potential. From the static characteristics with the resistance in the plate circuit all the dynamical phenomena are explained.—*Journal of Institute of Electrical Engineers of Japan*, November, 1923.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Boulder Dam Controversy

Dr. Hoxie Will Be Called to Testify—Los Angeles Councilor Criticises Power Companies

OPINION at Washington is that the Swing-Johnson bill providing for the government construction of the proposed Boulder Canyon Dam on the Colorado River cannot pass at this session of Congress. Hearings by the irrigation committee of the House continue. J. Ward Bannister of Denver has appeared on behalf of the state administrations of Colorado and Utah in opposition to the bill. It is the plan of Chairman Smith of the committee to have George L. Hoxie, consulting engineer of the Southern California Edison Company, appear just prior to the closing of the hearing. The committee is anxious to hear Dr. Hoxie, Representative Smith explains, but since other charges against the power companies besides those already made are likely to be brought forward, he thinks it will be well to hear Dr. Hoxie after they are all in.

The Secretary of the Interior has formally advised the committee that he has found it impossible to make a report on the bill within the ten-day limit which he set. His report will be forthcoming as soon as the views of his advisory committee are available. In view of the fact that engineers of the standing of A. P. Davis assert positively that the conduct of water from the Colorado River to Los Angeles is physically feasible, there is a general tendency to accept that view. From the standpoint of economics, however, the feasibility of the project is still generally questioned. It is also maintained that Los Angeles could effect a large saving of water were it to discontinue its municipal power generation, and information is wanted as to why the city now thinks of abandoning its big reservoir at the head of Owens Valley, on which large expenditures have been made.

Los Angeles Councilor Heard

Ralph L. Criswell, a member of the City Council of Los Angeles, testified before the committee on February 27. He declared that the power companies had been active in their opposition to the bond issue intended to expand the city's hydro-electric activities. He said the power companies would like to see Los Angeles obtain rights at small high-cost power sites while they would concentrate their efforts on getting lower-cost power on the Colorado, thus leaving the municipality at a disadvantage. He complimented R. H. Ballard, vice-president of the Southern California Edison Company, on his frankness and fairness.

The demand for power in Los Angeles, Mr. Criswell said, doubles every four years. In the section of the city served by the municipal plant the rate for household purposes is 5.6 cents per kilowatt-hour. That rate is met by the private power companies, but in sections of the city where municipal power is not available their rate is 6.2 cents, he declared. The municipality is developing power at a cost just barely above 3.5 mills, he testified. He was questioned at length as to accounting methods to determine if all costs properly chargeable to the expense of power generation are being included. He claimed large savings for Los Angeles because of municipal ownership as compared with the rates charged by private companies in San Francisco.

Mr. Criswell advocated the immediate construction by the government of the Boulder Canyon Dam and expressed the opinion that a reservation could be written into the law which would fully protect the upper basin states. He asserted that the private power companies are spreading propaganda to the effect that Los Angeles is trying to "hog" all the power which could be developed at the dam. He said Los Angeles had no desire to build the dam itself and denied that the real interest of the city in the development is in power rather than in water.

Secretary Hoover on Proposed Boulder Canyon Dam

Secretary of Commerce Hoover sees nothing valid in the point made by Representative Raker of California as to the power of the federal government to control sufficient water at the proposed Boulder Canyon Dam on the Colorado River to operate the hydro-electric plant which forms an important part of the project. Mr. Raker fears that should there be a period of low water the available supply would be held back for agricultural purposes and the plant stopped. Secretary Hoover's comment on this objection is:

"The volume of water is so ample that there would be no danger in this initial construction of any impairment of the power flow. Every further development of the river for power would reinforce further the power situation at Boulder Canyon."

In that connection Mr. Hoover discussed the Colorado River compact and expressed the opinion that Arizona's decision whether or not to ratify the compact would be determined at the next state election. "The Colorado River compact is approved by the majority of the people in Arizona," said Mr. Hoover.

Reclamation and Power

Federal Hydro Plants Attacked, but Senate Approves One—Southern Sierras Company Involved

A COMPARATIVELY small item in the Interior Department appropriation bill led last week to a heated discussion in the United States Senate as to the propriety of the government's entering into the generation and distribution of power. Senator Dial of South Carolina declared that "it is commendable to build hydro-electric plants and thereby save coal for future generations, but the time has come when we should stop spending money on enterprises that are not strictly governmental. We should leave it to the initiative of individuals. Let the people go on and develop the country as we have done in the past. If the policy of the government is going to be to lend money without interest, I want $3,000,000 to develop a large river to send electrical energy into Charleston."

Senators Wrangle

The discussion was precipitated by the action of Senator Ashurst of Arizona in accusing Senator Phipps of Colorado, who opposed building a government hydro-electric plant on the Yuma irrigation project, of voting money "into his own pocket." He read from Senator Phipps' testimony before a House committee in which he stated that he is financially interested in the Nevada & California Electric Corporation, which has its headquarters at Denver and of which the Southern Sierras Power Company is a subsidiary. Mr. Ashurst charged that the Southern Sierras company is opposed to the development of power on the Yuma project, which, he said, would, if carried out, cut the cost of energy to farmers in that district by nearly half.

Senator Phipps later presented a telegram from A. B. West, the president of the Southern Sierras company, asserting that it had not opposed the Yuma project. He cited a letter written last year to the manager of the project offering to take over the entire surplus output of the proposed plant and to supply its entire load demand at any time when the proposed plant would be shut down.

The Senate committee had opposed an appropriation of $250,000 for a hydro-electric plant and had offered an amendment striking it from the bill. This was done on the theory that no new construction on reclamation projects should be voted during the time that the whole question of reclamation is being overhauled. The Senate voted, forty-six to nine, to authorize the construction of the Yuma plant.

To Enjoin Electronic Sales

Court Asked to Forbid Sale of Stock of Company with Mysterious Lighting Process

AT THE instance of Attorney-General Sherman of New York State, who charges fraudulent practices, an injunction has been asked from the Supreme Court of that state restraining the Tomadelli Electronic Corporation, with headquarters at Forty-second Street and Broadway, New York, from selling any more of its stock to the public. This company, which was incorporated in Delaware in 1921 with an authorized capital of $1,500,000 in ten-dollar shares, is said to have disposed of considerable quantities of stock at as much as $50 a share.

The Tomadelli Electronic Corporation was formed to develop and perfect a so-called electronic lamp alleged to have been invented by Juan J. Tomadelli. It developed from the investigation of the authorities that Tomadelli went to New York late in 1920, announcing that at Buenos Aires he had "withdrawn from the atmosphere a form of electrical energy which he had transformed and with which he had bombarded a secret substance contained in the base of lamps he had constructed, causing a so-called disintegration of this substance, which created a light that burned continuously for seven and one-half months without renewal or recharging and which the inventor claimed would have burned three years were it not for a destructive bolt of lightning which destroyed his entire apparatus, his lamps and his laboratory." This secret substance, it was said, is composed of sea salt, tin and copper, using asphalt and paraffine as binder.

MAILLOUX AND SHARP REPORT

Two disinterested electrical experts were selected by Deputy Attorney-General Chambers to investigate the merits and truthfulness of the company's claim—Dr. C. O. Mailloux and Dr. Clayton H. Sharp. They went to the factory of the company at Harrison, N. J., and made a careful and painstaking study of the apparatus itself in company with Tomadelli, but when it came to a demonstration of the operation of the apparatus access was refused them to the portion of the room which would have given them an opportunity to determine whether or not it functioned as represented. They made a complete report of their findings and in conclusion they said:

"In our talks with Mr. Tomadelli it was apparent that he had some knowledge of the modern scientific jargon enabling him to use the terminology with a limited degree of accuracy. Many of Mr. Tomadelli's statements were so utterly at variance with known scientific facts as to be unworthy of any credence whatever. His statements of the action which he gets were very vague and in many instances they were inconsistent and contradictory. Moreover, there was nothing in what was shown to us or in any explanation or statements received by us which would tend to convince us that the apparatus seen by us has any possibilities of practical application or that it has any industrial or commercial value."

Mr. Tomadelli's right to the European university degrees ascribed to him is also disputed by the Attorney-General's department.

Penstock Break at El Dorado Plant Due to Bad Steel

Investigation into the bursting of a section of the penstock feeding the El Dorado plant of the Western States Gas & Electric Company, which accident was recorded in the ELECTRICAL WORLD for January 12 (page 105), has been completed by the designer and builder of the plant, the Byllesby Engineering & Management Corporation, in conjunction with the M. W. Kellogg Company of Jersey City, the builder of the penstock, and it has been ascertained that the failure was due to defective steel plate. Where the rupture occurred in the 30-in. pipe the plate was found to be badly laminated. The welds were not affected.

The El Dorado plant has a head of 1,909 ft., one of the highest in America.

New Mexico Electrical Men Talk Public Relations

The omnipresent topic of public relations was the chief theme of discussion at the tenth annual convention last week of the New Mexico Electrical Association, which was held from Monday to Wednesday at the new Franciscan Hotel in Albuquerque. Seventy-five utility men, including a large representation from Colorado and Wyoming, were in attendance. The convention included a quarterly section meeting of the Rocky Mountain Division of the National Electric Light Association.

J. H. MacMillan, manager of the Santa Fé Water & Light Company, was elected president for the coming year in succession to E. A. Bradner. Other officers elected were: First vice-president, K. W. Kissick, manager Deming Ice & Electric Company; second vice-president, Frank Schram, superintendent Roswell Public Service Company. B. Lamwiles of Albuquerque, D. W. Morgan of Las Cruces and E. A. Bradner of Las Vegas were made members of the executive committee.

Power Rate Reductions in Indianapolis

Electric power rate reductions effecting a saving of $350,000 a year to 7,500 consumers in Indianapolis have been ordered by the Public Service Commission. The Indianapolis Light & Heat Company and the Merchants' Heat & Light Company have agreed to the reductions and the order will not be contested in court. The new rates become effective with the filing of the new schedules. Power customers of the Indianapolis Light & Heat Company will save approximately $250,000 a year, and those served by the Merchants' company will save $100,000. Large power consumers are virtually the only ones directly affected by this order, but it is expected that a reduction in the rates for domestic lighting will follow.

Atlantic Coast Superpower

W. S. Murray Explains Economical and Financial Aspects and Relation of Plan to Rail Electrification

BY SPENDING $1,500,000,000 now on a superpower system extending from Boston to Washington, D. C., and inland 150 miles, $500,000,000 will be saved yearly by 1930. This feature of the Atlantic Coast superpower plan was again emphasized by W. S. Murray, consulting engineer, before a joint meeting of the A. I. E. E. and the A. S. M. E. held in New York on February 27.

Mr. Murray pointed out that superpower actually involves: (1) Maximum commercial efficiency with reliability in the generation, transmission, distribution and utilization of power, (2) minimum steam and maximum hydro-electric power in use at all times, (3) interconnection between steam and hydro-electric systems for the greater utilization of the latter, and (4) transmission at 220 kv., thereby increasing the economical distribution of power to a radius of from 300 miles to 400 miles.

On the financial aspects Mr. Murray referred to an article by A. L. Loomis (see ELECTRICAL WORLD for January 5, 1924, page 31), in which it is stated that the capital investment in electric utilities is more than $5,500,000,000. New capital to the amount of $600,000,000 annually will be needed for the next ten years. For meeting this the following program is reasonable: $50,000,000 from surplus earnings, $75,000,000 in common stocks, $200,000,000 in preferred securities and $275,000,000 in bonds. To the latter should be added $125,000,000 a year to refund maturing and called issues, or a total of $400,000,000 in bonds.

RAILROAD CONVERSION

Discussing superpower in relation to railroad electrification, only the matter of depleted credit in the past few years had prevented many companies from electrifying their roads, while with those companies that could afford it the wide divergence of opinion as to the proper system to install had hindered progress. The actual power demand of an electrified road is small in comparison with the traffic handled. As an example Mr. Murray said that on the New Haven road a single modern generator of possibly 60,000 kw. would supply all necessary power, as the normal load drawn is about 35,000 kw.

Mr. Murray expressed the belief that 1,500-volt direct-current motors and the high-voltage alternating-current overhead-trolley system are the most economical arrangement. This requires a conversion unit on the locomotive. Trial locomotives of this type are now being built, and it is hoped that valuable cost and operating data will be forthcoming when they are placed in operation. In standardization of electric equipment there is still a long way to go. The steam engine can be used on practically every road of standard gage in the country, while of the seven electrified roads, Mr. Murray said, no locomotive of one road can be used on any other. One of the important requirements is that a uniform contact system be adopted.

Deadlock Likely at Albany

Small Chance for Governor's Water-Power Authority Bill to Go Through

A DEADLOCK, with the Democratic Senate voting for a bill fathered by Governor Smith and the Republican Assembly supporting a rival measure approved by Speaker Machold, is likely to be the outcome of the water-power situation in the New York State Legislature this year. Mr. Machold had accepted in theory Governor Smith's proposal of a "Water Power Authority" functioning much as the present Port Authority does (see ELECTRICAL WORLD, January 5, page 60), but repeated conferences between the two political leaders failed to evolve a measure that both would support. On Tuesday of this week it was announced that every prospect of agreement had vanished, and on Wednesday the divergent bills were introduced in both houses.

The two measures differ chiefly in that the Governor's bill defines a state policy with regard to water-power development which is meant to place the alienation of the state's rights in its power resources out of the question, while the Republican measure merely provides for the creation of a body which for the next year would have no power except to make a preliminary survey of the state's resources and methods of development. For that purpose an appropriation of $100,000 is provided.

THE MATTER IN DISPUTE

One portion of Governor Smith's bill to which the Republican leaders objected is the following clause:

"The natural resources available for the generation of hydro-electric energy in connection with the Niagara and St. Lawrence Rivers and in connection with inland streams and waterways, now owned or hereafter acquired by the state, shall forever remain the property of the people of the state. The sites, works, developments and improvements established or undertaken by the state in connection with such resources shall not be sold, leased, exchanged or conveyed to any private corporation, individual or agency, but shall always continue under public control."

Speaker Machold said that the Governor had proceeded to tell the Power Authority through his bill what the state should do, all in advance of the proposed investigation and survey. "The Machold bill," said Governor Smith on his part, "takes out all that is essential and important. It means nothing."

Passage of Oklahoma Utilities Bill Doubtful

Doubt is expressed as to the passage by the Oklahoma Legislature this year of the bill affecting public utilities of which the main clauses, introducing revocable permits and other changes, were outlined in these columns February 23 (page 399). There is no organized opposition to the bill in the Senate, and none is thought likely in the House, but so far there has been also a lack of active championship of the measure in the legislative body. However, its promoters think their efforts are having an educative effect and will bear fruit in a year or two.

The committee to which the bill was referred struck from it the provision for a gross receipts tax of 1½ per cent payable to municipalities by utilities availing themselves of the benefits of this measure, on the ground that such a tax was uneconomical and would be used by city officials in some cases to levy a tax upon the public in excess of the constitutional limit. The bill preserves, however, any gross receipts tax already required by franchise contracts.

Superpower Line to Tie Plants in Chicago Environs

This year will see Chicago and its environs linked up into a "superpower system" in its practical sense, according to an announcement made by Samuel Insull, speaking before the annual stockholders' meeting in Chicago on February 25. It will be accomplished by completing a 132,000-volt line around the outskirts of the city, joining all the major generating stations of these two companies on the north, west and south sides. Already the Commonwealth Edison Company has the largest generating capacity and largest maximum load of all single companies in the world, and with the generating facilities installed and under construction by the two companies the trunk line will permit greater interchange of energy, assure still more reliable service and permit the most economical utilization of the equipment.

"For economic reasons it is necessary that the various systems in a given territory be connected closely so that they can interchange power wherever it is an economical thing for them to do," Mr. Insull said. "Work is under way for a 132,000-volt superpower line from the Calumet station south to the Chicago city limits to connect with a similar superpower line feeding east to the Northern Indiana Gas & Electric Company to supply the steel district and on east, and running west to tie in with the Joliet station of the Public Service Company.

"This and the 132,000-volt superpower line from Waukegan to Evanston represent marked progress toward a superpower ring around Chicago. Though a considerable part of this ring is outside of the city limits, it will when completed tie in all of the large generating stations owned by the Commonwealth Edison Company and those in the territory surrounding Chicago and thus provide protection to continuous service as well as result in considerable economies in operation."

Following the precedent set by the Commonwealth Edison Company last year, the entire proceedings of the stockholders' meetings of that company and of the Public Service Company of Northern Illinois were broadcasted. At the Commonwealth Edison meeting twenty-five hundred stockholders crowded Consumers' Hall. Figures from the annual report of the company are given in the next column.

More Good Annual Reports

Chicago, Baltimore, Pittsburgh and Other Light and Power Companies Give 1923 Figures

THE Commonwealth Edison Company of Chicago for the year ended December 31, 1923, presents the following figures in its annual report:

Operating revenues	$49,136,041.52
Operating expenses (including retirement expense $3,912,724.91)	31,583,421.90
Net operating revenues	$17,552,619.62
Uncollectible bills, taxes and municipal compensation	5,877,306.25
Net operating income	$11,675,313.37
Other income	557,269.87
Gross income	$12,232,583.24
Deductions from gross income	1,627,852.54
Balance	$10,604,730.70
Interest on funded debt	3,052,613.33
Available for dividends	$7,552,117.37
Dividends paid	5,389,002.00
Balance carried to surplus	$2,163,115.37

During the year 77,852 new customers were added to the company's lines—a greater increase than in any other year—making the total number of customers served 688,155. The total output of energy was 2,573,287,000 kw.-hr., as compared with 2,225,443,000 for 1922, an increase of more than 15 per cent. Capital stock was increased from $80,000,000 to $100,000,000.

The Public Service Company of Northern Illinois reports net income of $2,434,394 for 1923, as against $1,835,470 in the year before. After preferred dividends there was earned per each common share $8.99, which compares with a balance of $8.12 per share the year before.

The Shawinigan Water & Power Company, whose offices are at Montreal, reports gross earnings for 1923 of $5,110,539 compared with $4,629,641 in the previous year. After charges and taxes there remained net income of $1,631,560.

The report of the Consolidated Gas, Electric Light & Power Company of Baltimore covering operations for the twelve months ended December 31, 1923, shows the corporation to be in the strongest condition financially and physically in its history. Gross income was larger by $1,845,614, or 9.1 per cent, than the total reported for 1922. Operating expenses and taxes increased $1,136,865, or 9.9 per cent. Net earnings were $9,633,107, a gain of $708,749, or 7.9 per cent. The balance, after paying fixed charges, was $6,401,012, a gain of $882,342, or 16 per cent.

The 1923 report of the Duquesne Light Company of Pittsburgh shows net income of $4,879,724 after depreciation, taxes and other charges, equivalent after deducting preferred-stock dividends to $19.29 a share earned on $19,226,000 common stock. This compares with $4,232,734, or $21.17 a share, in 1922. Gross earnings were $19,383,622 in comparison with $16,928,746 in 1922.

The Colorado Power Company for the twelve months ended January 31 reports gross earnings of $1,256,400 against $1,039,913 in the preceding twelve months. The net income after taxes, charges and depreciation reserve was $335,604 against $226,909.

America's Part in World Power Conference

Tentative Program Includes Review of Power Resources, Discussion of Steam and Hydro Production, Industrial, Economic, Financial and Legal Phases

BELOW is printed a syllabus of the tentative program of papers to be presented at the World Power Conference in London, June 30 to July 12, by American delegates, as given out by O. C. Merrill, general chairman of the American committee. The program committee is composed of John W. Lieb (chairman), Peter Junkersfeld and Calvert Townley. The formal titles of the papers have not been decided upon fully in all cases. The plan of the program committee was to explain the character and extent of American power development from both the construction and the operation standpoint and give opportunity for setting forth conditions under which American capital has been able to undertake this development.

REVIEW OF POWER RESOURCES

The first division of the program will give a national review of power resources, their distribution and utilization, by O. C. Merrill, executive secretary Federal Power Commission; N. C. Grover, chief hydraulic engineer United States Geological Survey, and M. R. Campbell, geologist with the Geological Survey. Regional reviews will be given as follows: For the Northeastern States by John W. Lieb, vice-president New York Edison Company; for the Central States by Samuel Insull, president Commonwealth Edison Company of Chicago, and for the Pacific States by A. H. Markwart, vice-president Pacific Gas & Electric Company, and H. A. Barre, executive engineer Southern California Edison Company.

WATER AND STEAM POWER

The problem of water-power production will make up the second section of the program. John R. Freeman, consulting engineer, Providence, R. I., will give a general review of current practice. Henry J. Pierce, president of the Washington Irrigation & Development Company, and E. C. Bebb, hydraulic engineer, Federal Power Commission, will outline the relation between power development and irrigation. A. P. Davis, consulting engineer, will discuss the design and construction of high dams. Two authors will treat problems of waterwheels, the paper on impulse waterwheels being given by William M. White, manager and chief engineer Allis-Chalmers Manufacturing Company, and the paper on reaction wheels by H. Birchard Taylor, vice-president of William Cramp & Sons Ship & Engine Building Company. Power development on navigable rivers will be treated by an author to be announced later.

The section of the program devoted to the preparation and use of fuels will consist of one paper by C. F. Hirshfeld, chief of the research department of the Detroit Edison Company.

The discussion of steam power production will be opened by a general review of current practice prepared by Peter Junkersfeld and George A. Orrok, consulting engineers. D. S. Jacobus, advisory engineer of the Babcock & Wilcox Company, will review the present practice in steam generation in the United States. W. L. R. Emmet, consulting engineer General Electric Company, will write on power from mercury vapor, and W. S. Monroe of Sargent & Lundy will present the latest developments in high pressure and superheat. Steam turbines and condensing equipment will be handled by Francis N. Hodgkinson, chief engineer Westinghouse Electric & Manufacturing Company, South Philadelphia works.

The electrical problems of transmission and distribution will be discussed by three authors, B. G. Lamme, chief engineer Westinghouse Electric & Manufacturing Company, who will treat the topic of electrical equipment for power stations; F. G. Baum, consulting engineer, who will discuss the technical problems of high-tension electric transmission, and W. S. Murray, consulting engineer, who will relate the economies of power development in large stations interconnected into a single superpower system.

INDUSTRIAL PHASES

The industrial phases of power utilization will be represented by three papers, one on steel-mill operation by B. H. Shover, consulting engineer; one on the textile industry by Charles T. Main, consulting engineer, and the third on the paper industry by A. H. White, chief engineer International Paper Company.

A general review of electrochemical progress and processes in the United States will be given by F. A. J. FitzGerald of the FitzGerald Laboratories of Chicago. Electric power in metallurgy will be discussed by an author to be announced later.

The discussion of the power problems of transport will be provided in two papers, one on railroad electrification by Bion J. Arnold, consulting engineer of Chicago, and the second on electric ship propulsion by an author to be announced.

ECONOMIC AND OTHER PHASES

Under the section devoted to the economic, financial and legal phases of power development, Herbert Hoover, Secretary of Commerce, will present the government policies relating to power development; S. Z. Mitchell, president of the Electric Bond & Share Company, will outline the problems of financing power development in the United States, and Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company, will describe the relation of power development to industrial and economic progress. Owen D. Young, chairman of the board of the General Electric Company, will present the international viewpoint on power development, and Carl D. Jackson, former president of the National Association of Railway and Utilities Commissioners, will relate the policy and practice in the United States in public regulation of public utilities. An author to be announced later will discuss private versus public ownership and operation.

The relation of power application to public welfare and industrial expansion is the generalized subject of a paper by Julius Barnes, president of the United States Chamber of Commerce, which will be given in the general section of the program. This section will also contain papers by E. W. Rice, Jr., honorary chairman of the board of the General Electric Company, who will point out new fields for the application of power, and Arthur E. Kennelly, professor of electrical engineering at Harvard University and the Massachusetts Institute of Technology, who will tell of progress in international standardization in the power field. The fourth paper in this section will treat of the relation of power development to labor, the author to be announced at a later date. F. H. Shepherd, W. B. Potter and L. B. Stillwell will participate in a discussion of railroad electrification, and H. I. Harriman will discuss the relation of power development to industrial and economic progress.

The papers to be submitted at the conference will be printed and distributed sufficiently early to allow their study prior to the opening of the sessions. Papers will not be read in full, but the sessions will be devoted to oral discussion of the subjects with which they deal.

Sioux City Going Ahead with Its New Plant

The Sioux City Gas & Electric Company, which had temporarily postponed the construction of a large generating station on the Big Sioux River, is now ready to proceed with the undertaking, according to W. J. Bertke, general manager, which will cost in the neighborhood of $3,500,000 and will furnish energy not only for Sioux City but for more than a hundred smaller places in Iowa, Nebraska and South Dakota within a radius of a hundred miles. The site is an 18-acre tract on the east bank of the river, between Janet and Florence Streets.

The equipment will consist of two 11,250-kw. turbines with the necessary boilers and auxiliaries. The station will have an ultimate capacity of at least 90,000 hp. The furnaces will burn low-grade pulverized Iowa coal. Other features of the equipment include devices to absorb the heat that usually escapes up the stacks, electric motors to drive the small auxiliary apparatus and a special treatment of the river water to make it suitable for boiler purposes.

The building will be of reinforced concrete and brick, and it is expected that it will be ready for the installation of equipment next fall and that the plant will be in operation by July 1, 1925. The power will be generated at 13,000 volts, which will be raised on the station site to 33,000 volts for transmission. The two existing power stations will be used for reserve power.

Utility Control in New York

Proposed Bill Would Permit Municipalities to Meet Deficits by Bonds and Taxation

THREE bills providing for municipal control and operation of public utilities have been introduced into the New York State Legislature at the instance of Mayor Hylan of New York City and his political friends. The first relates to transit and the second to bus lines, and these are intended to carry out the local policies of the metropolitan administration. The third bill, introduced by Senator Twomey and Assemblyman Bloch, is a sweeping measure empowering all cities to own and operate transportation lines, gas or electric heating, lighting and power plants, telegraphic and telephonic communication and any "other public service for which a franchise or consent is required to be given by public authority."

This bill would confer upon any city, acting through its board of estimate or equivalent governing board, the following powers: "(1) To establish, install, construct and equip city utilities; (2) acquire, by purchase or condemnation, property for the purpose of a city utility, whether the property be held for a utility purpose at the time or otherwise; (3) maintain and operate a utility so established, installed or constructed; (4) enlarge a city utility by improvement, extension or development; (5) perform any work necessary for the establishment, installation, construction, equipment or enlargement of a city utility or the improvement or repair of property, either directly, through its officers and employees, or by contract; (6) acquire, construct, equip and install power houses and power plants, terminals, shops, storage places and all necessary appurtenances thereof; (7) sell surplus power and by-products produced by any city utility; (8) establish and regulate rates and charges for service rendered by any city utility, and (9) do any and all things necessary to the full and effective exercise of any of the powers of the city under this article."

The governing board of a city may also by the terms of the bill order the merging of public utilities, whether under private or public control, into systems, the only restriction being that the merger must involve only corporations in the same field. Bonds issued for public utility purposes, regardless of resources in the sinking funds for which provision is made, would be guaranteed by the city. The bonds would be tax-exempt.

Losses from operation would be made up by issuing revenue bonds, for the aggregate of which no limit is established and ultimately by resort to the tax rate. Revenue bonds issued to meet losses incurred in municipal operation would not be subject to the yearly limitation of amount contained in the charter of the city concerned.

The Twomey-Bloch bill is to be followed by others of the same trend. There is thought to be little likelihood of any of these bills passing, though they have strong support.

Savings Banks Are Favorably Disposed to Utility Bonds

Group V of the State Savings Banks Association of New York at a meeting on Tuesday approved in principle the proposed legislation which would add to the "legal" list the first mortgage or refunding bonds of artificial gas, electric light and power, telephone and telegraph companies of proved earning capacity. A resolution was adopted requesting the legislative committee of the association to confer with the Superintendent of Banks in the preparation of a bill to give savings banks the privilege of making utility investments.

The savings banks in Group V include those of Brooklyn, Long Island and Staten Island. Thus far all the savings banks of New York State have approved the proposed legislation with the exception of the Manhattan-Bronx-Westchester group, which has laid the proposal on the table to be taken up at the next meeting of that group.

New Offerings Totaled $72,184,700 in February

DURING the past month public sales of electric light and power utility securities by investment houses amounted to $72,184,700, against a total of $57,594,000 offered in the month of January and $57,811,600 in February, 1923. A volume of this magnitude reached during so short a month is indicative of the eagerness with which electric light and power securities are sought. Twenty-eight issues were offered, of which the largest single issue was the $9,000,000 offering of the Wisconsin Electric Power Company offered at 91¼ and yielding 5.60. The rate of return yielded the investor dropped to 6.27. Five short-term offerings appeared during the month.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN FEBRUARY

Name of Company	Amount of Issue	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
Beloit Water, Gas & Electric Co. (Wis.)	$200,000	13	First mortgage sinking-fund gold bonds....	To reimburse for extensions	5	94	5.65
Carolina Power & Light Co. (N. C.)....	1,000,000	29	First and refunding mortgage gold bonds..	To reimburse for construction and for other purposes	6	100	6
Central Illinois Public Service Co.....	2,000,000	20	First mortgage and refunding gold bonds, series C	To reimbruse for capital expenditures and for refunding	6	94	6.55
Puget Sound Pwr. & Lt. Co. (Wash.)...	2,575,700	..	Cumulative prior preferred stock	Construction	7	103½	6.75
Washington Water Power Co. (Wash.).	1,000,000	2	Coupon notes	New capital	6	100¾	5.60
American Gas Co. (Pa.).....	2,500,000	10	Sinking fund secured gold bonds (closed)..	To retire floating debt and provide working capital	7	99	7.10
Connecticut Light & Power Co.....	5,750,000	30	First and refunding mortgage sinking-fund gold bonds, series B	Additions	5½	96½	5.75
Continental Gas & Elec. Corp. (Neb.)..	5,700,000	30	Collateral trust gold bonds, series A	To purchase interest in another property	7	100	7
General Gas & Electric Corp. (N. Y.)..	609,000	..	Cumulative preferred stock, class A, participating and non-callable	Additions and other corporate purposes..	8	101½	7.85
Louisville Gas & Electric Co. (Ky.)....	2,500,000	13	Sinking-fund gold debenture bonds, series A	Additions	6	94	6.65
Ohio Power Co.....	2,000,000	29	First and refunding mortgage gold bonds, series C	To reimburse for capital expenditures...	6	99	6
Power Corporation of New York.....	1,000,000	3	Gold debentures (closed)	Construction	6½	99½	6.70
Syracuse Lighting Co., Inc. (N. Y.)....	7,000,000	30	First and refunding gold bonds	Additions and refunding	5½	97	5.70
Texas Power & Light Co.....	1,300,000	13	First mortgage gold bonds	Additions	5	93½	5.70
Wisconsin Electric Power Co.....	9,000,000	30	First mortgage gold bonds, series A	Refunding and additions	5	91¼	5.60
Portland Ry., Lt. & Pwr. Co. (Ore.).....	500,000	..	Cumulative prior preferred stock, series A	To reimburse for construction	7	98	7.13
Kansas City Power & Light Co. (Mo.)..	2,000,000	29	First mortgage gold bonds, series A	To meet indebtedness incurred by additions	5	91	5.63
Northwestern Public Service Co. (S.D.)	250,000	..	Cumulative preferred stock		7	90	7.78
United Pwr. & Lt. Corp. of Kansas.....	3,250,000	20	First mortgage gold bonds, series A	Refunding	6	97½	6.20
Southern Indiana Gas & Electric Co....	750,000	10	Sinking-fund gold debenture bonds	Refunding and to reimburse for construction	7	95½	7.65
Wisconsin Valley Electric Co.....	500,000	18	First mortgage bonds	To reimburse for capital expenditures and for construction	5½	98	5.70
New England Power Co. (Mass.).....	1,800,000	3	Gold coupon notes	Construction	6	99¼	6.10
Eastern New Jersey Power Co.....	3,250,000	25	First mortgage gold bonds	Acquisition of properties, refunding and additions	6	95	6.40
Sioux City Gas & Electric Co. (Ia.)....	2,550,000	25	First mortgage gold bonds, series B	Construction	6	98	6.15
Montreal Tramways & Power Co., Ltd. (Que.)	8,000,000	5	Collateral trust bonds	Refunding	6	96½	6.80
Oklahoma Gas & Electric Co.....	2,000,000	2	Gold notes	To provide working capital	6	98	7
Tennessee Electric Power Co.....	3,000,000	23	First and refunding mortgage gold bonds, series A	Additions	6	96	6.30
Dubuque Electric Co. (Ia.).....	200,000	18	First mortgage gold bonds	Additions	6	97¾	6.20
Total.....	$72,184,700						

Jameson Offers to Buy Hudson (Mass.) Municipal Plant

R. H. Jameson, manager Marlboro (Mass.) Electric Company, appeared on February 19 before the Hudson Board of Public Works to champion a proposal to purchase the existing municipal electric lighting plant and distribution system at Hudson and to operate it under the corporate name of The Hudson Electric Light Company. The present plant, including substation equipment for the transformation of power supplied by the New England Power Company for local distribution, totals about 2,000 kw. There are about 2,300 customers, and the residence lighting rate is 11¼ cents net per kilowatt-hour. The town faces the necessity of raising about $250,000 for plant expansion to meet future load requirements.

Mr. Jameson promised that if the town goes out of the central-station business, the new company will establish rates encouraging the development of commercial lighting and power in stores and factories, the present mercantile lighting rate being the above maximum of 11¼ cents. At present the town cannot generate energy at a cost which attracts industrial power business, and if the deal goes through, local manufacturing plants will be much benefited. It is estimated that within three years five times the present energy consumption will be developed under private management. Mr. Jameson stated his willingness to purchase the Hudson electric plant either at its book value or at an appraised value to be determined by the Massachusetts Department of Public Utilities. The plant is understood to be worth approximately a quarter of a million dollars.

Briefer News

Grand River Power Plant in Operation.—The first unit of the three-million-dollar electric plant of the Oklahoma General Power Company, just below the confluence of the Grand and Arkansas Rivers, was placed in use February 14, and the second unit the following day.

Chicago Plans Lighting Demonstration.—Under the joint auspices of the Chicago Section, Illuminating Engineering Society, and the Electric Club of Chicago, the week of March 3 will be given over to a demonstration and exhibit of practical store lighting, to which seven thousand retail merchants will be invited.

Vermont Electrical Association.—This association, of which A. W. Peterson is president, met at Barre, Vt., on Thursday of this week. Business sessions and a banquet were held, with short addresses by Thomas H. Day on grounded secondaries, C. P. Myrick on domestic cooking, J. T. McLaughlin on joint-line construction and W. A. Pressey on feeder regulators.

Interconnection in Texas.—The West Texas Utilities Company of the American Public Service Company group recently completed negotiations which were inaugurated several months ago whereby the first-named company may buy power from and sell power to the Wichita Falls Electric Company, the West Texas Electric Company of Sweetwater, the Oil Belt Power Company of Eastland and the Texas Power & Light Company of Brownwood by means of interconnections at advantageous points.

Birmingham Utility to Be Sold on March 24.—Official announcement has been made that the Birmingham Railway, Light & Power Company will be sold by auction on March 24. This action will probably be followed by a reorganization of the property, which has been in receivership for some time.

Oklahoma Utilities Association.—For the sixth annual convention of the Oklahoma Utilities Association, to be held at the Huckins Hotel, Oklahoma City, March 11-13, there will be, besides many papers of general interest to all utility companies, some of special electrical import. Among these will be discussions of "Electric Transmission-Line Service to Farmers," "Street Lighting and Its Effect on the Central-Station Load," "Theft of Energy and Protective Meter Devices," "Handling and Financing Line Extensions," "Work of the Gas and Electric Division of the Corporation Commission" and "Conservation of Power."

Building Hopes on Ford.—Petitions are being circulated throughout north Alabama asking the Alabama Public Service Commission to delay granting the petition of the Alabama Power Company for permission to erect a power line through that part of the state. The petitions aver that to grant the power company's petition at this time would tend to interfere with the legislation now pending in Congress looking to the leasing of Muscle Shoals to Henry Ford. The petitions also assert that should the Muscle Shoals property be leased to Henry Ford the power rates in north Alabama will be reduced.

Insull Suggests Customer Ownership as Solution of Chicago's Transit Problems.—Speaking before the Chicago and Cook County Bankers' Association last week, Samuel Insull, president of the Commonwealth Edison Company, outlined a plan to raise $23,000,000 to double Chicago's transit facilities by applying the principle of customer ownership to the railway lines. He pointed to the 34,256 stockholders of the Commonwealth Edison Company, more than 85 per cent of whom live in Chicago and use the service. Mayor Dever, who favors the municipality's taking over and operating all city transit systems, has attacked Mr. Insull's proposal.

Ohio Edison to Absorb Springfield Light, Heat & Power.—Announcement is made that, under an agreement by the directors of the two companies, the Springfield (Ohio) Light, Heat & Power Company will be merged soon into the Ohio Edison Company. The two companies have been closely allied. Stockholders will meet March 24 to vote. The Ohio Edison Company owns the electric distribution systems in Urbana, Cable, Woodstock, Mutual, Catawba, Mechanicsburg, Marysville, Milford Center, Ostrander, and other places in Ohio and the transmission lines con-

New Electrical Engineering Building at Purdue

THE construction of the first of four units of the new building for the School of Electrical Engineering at Purdue University, Lafayette, Ind., was well under way when the cornerstone was laid a short time ago with ceremonies appropriate to the occasion. The new building is the first of an engineering group to be started on the north campus to provide for the needs of the four engineering schools, in which 1,900 students are registered. The ultimate structure will include a building 180 ft. by 220 ft., three stories high, but the unit now under construction will house only the electrical laboratory and lecture room.

Power is to be supplied from the new university power station at 2,300 volts, three-phase, to substation equipment installed in a central area in the main laboratory. Alternating current at 110 and 220 volts, as well as direct current at 125 and 250 volts, will be made available at forty-six motor blocks and floor-test positions by means of a main switchboard and six auxiliary distribution switchboards. The lecture room, which will seat 480 students, is provided with a moving-picture booth and demonstration circuits connected with the laboratory switchboard. The unit now under construction represents a cost of $108,000, while the ultimate structure is estimated to cost $400,000. It will be possible to move the greater part of the laboratory equipment to the new building next summer, and the construction of the second unit will permit the transfer there of virtually all of the activities of the School of Electrical Engineering.

necting these systems, as well as a power plant site on the Mad River near Springfield.

Tennessee Company Will Lease Alabama Plants.—The Southern Cities Power Company of Chattanooga, Tenn., is asking the Alabama Public Service Commission for permission to lease the electric light and power properties in the towns of Stevenson, Bridgeport and Scottsboro, Ala., all owned by the Public Light & Power Company of Chattanooga, Tenn. Approval of the lease has been obtained from the Tennessee State Utilities Commission.

Houston's New Plant Nearly Ready.—The first 20,000-kw. generating unit for the Houston (Tex.) Lighting & Power Company's new Deepwater station was recently shipped by the General Electric Company and another will soon follow. The station is designed for an ultimate capacity of 180,000 kw. and is designed to supply power to the city of Houston in conjunction with the existing Gable Street plant. The power will be used for street railway, lighting and industrial purposes.

Seattle's Municipal Plant.—An ordinance authorizing the expenditure of $957,913, the balance of the eleven-million-dollar bond fund raised to construct the Gorge Creek plant of the City of Seattle, has been introduced in the Council. According to the engineer in charge, this amount will complete the work and power from the plant will be brought into the city some time during May. The Council, however, has ordered an investigation of the whole Skagit hydro-electric project, of which Gorge Creek forms part, and completion of the plant referred to may be delayed. The initial development by the city will have a capacity of 54,000 hp., and plans call for an ultimate development of about half a million horsepower.

Association of Electragists International Arranges Program.—For the Eastern Division convention of the Association of Electragists International, which will meet at the Hotel McAlpin, New York, on Tuesday, March 18, this afternoon program has been arranged: Merchandising policy committee report, W. Creighton Peet, New York; "The Electragist," Joseph G. Crosby, Philadelphia; "National Electrical Code," A. Penn Denton, Kansas City; "Co-operation in California," Clyde L. Chamblin, San Francisco; "Cost Data and Statistical Work of the Association," Laurence W. Davis, New York. In the evening there will be a reception and dinner-dance. Joseph A. Fowler of Memphis, Tenn., and Frank W. Smith of New York will speak.

San Joaquin Authorized to Provide $25,000,000 of Preferred Stock.—The San Joaquin Light & Power Corporation has been authorized by the California Railroad Commission to amend its articles of incorporation to provide for $18,500,000 par value of series "B" 7 per cent preferred stock, cumulative from date of issue, and $6,500,000 of series "A" 6 per cent preferred stock and to issue not exceeding $6,500,000 of said series "B" 7 per cent preferred stock in exchange for a like amount of series "A" 6 per cent preferred stock, provided that the company shall agree not to pay any dividends on its common stock until the surplus (which was $3,197,203 on November 30, 1923) shall have been increased to $4,000,000 and to maintain the surplus at not less than that figure.

New Englanders to Hold Commercial Meeting at Hartford March 5.—Norman T. Wilcox, chairman National Commercial Section, N. E. L. A., will address the Commercial Section of the New England Division of the association March 5 at the Bond Hotel, Hartford, Conn., upon "Ultimate Possibilities for Residence Service." This will be a luncheon meeting, and the other speakers will include President Samuel Ferguson of the New England division, P. L. Miles, manager range department, Edison Electric Appliance Company, Chicago, upon "Ranges and Water Heating," and Warren F. Clark, general manager Sepco Automatic Electric Heater Company, Philadelphia, on "The Value of Water-Heating Load to the Central Station."

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

American Electric Railway Association—Midyear meeting, Chase Hotel, St. Louis, March 4-5. J. W. Welsh, 8 West 40th St., New York.

Oklahoma Utilities Association—Huckins Hotel, Oklahoma City, March 11-13. E. F. McKay, First National Bank Bldg., Oklahoma City.

Association of Electragists, Eastern Division—McAlpin Hotel, New York, March 18.

Illinois State Electric Association—Hotel Sherman, Chicago, March 26-27. R. V. Prather, Springfield, Ill.

Southern Appalachian Water Power Conference — Chattanooga, Tenn., March 26. J. A. Switzer, Knoxville, Tenn.

American Institute of Electrical Engineers—Spring convention, Birmingham, Ala., April 7-11. F. L. Hutchinson, 33 West 39th St., New York.

Middle West Division, N. E. L. A.—Kansas City, Mo., April 9-12. H. M. Davis, Bankers' Life Bldg., Lincoln, Neb.

Missouri Association of Public Utilities—Kansas City, April 10-12. F. D. Beardslee, 315 North 12th St., St. Louis.

Wisconsin Utilities Association—Hotel Pfister, Milwaukee, April 17-18. John N. Cadby, 445 Washington Bldg., Madison.

Southwestern Division, N. E. L. A.—New Orleans, April 22-25. S. J. Ballinger, San Antonio, Tex.

Southwestern Public Service Association—New Orleans, April 22-25. E. N. Willis, Dallas, Tex.

American Electrochemical Society—Hotel Bellevue-Stratford, Philadelphia, April 24-26. C. G. Fink, Columbia University, New York.

American Physical Society—Washington, April 25-26.

Wyoming Utilities Association—Cheyenne, May 5-6. H. C. Chappell, Casper, Wyo.

Nebraska Section, N. E. L. A.—Omaha, May 8-9. H. M. Davis, Bankers' Life Bldg., Lincoln.

National Electric Light Association—Atlantic City, N. J., May 19-23. M. H. Aylesworth, 29 West 39th St., New York.

Electric Power Club — Seaview Golf Club, Absecon, N. J., May 26-29. S. N. Clarkson, B. F. Keith Bldg., Cleveland.

Electrical Supply Jobbers' Association—Homestead Hotel, Hot Springs, Va., June 4-6. Franklin Overbagh, 411 South Clinton Street, Chicago.

Associated Manufacturers of Electrical Supplies—Hotel Ambassador, Atlantic City, N. J., June 24-27.

Illumination Experts Talk at Edison Lamp Works.—A midwinter conference of representatives of central-station companies handling lighting was held at the Edison Lamp Works of the General Electric Company, Harrison, N. J., on February 11-15. Various phases of lighting were discussed with the primary purpose of promoting better standards of lighting practice. The program included discussions on illumination topics by G. H. Stickney, A. B. Oday, J. A. Summers, A. S. Turner, Miss Hill, A. D. Bell, H. A. Cook, A. L. Powell, J. H. Kurlander and O. P. Anderson, as well as business talks. Many central-station representatives attended. The conference was held under the direction of R. E. Harrington of the Edison Lamp Works publicity department.

Egan Announces Hundred-Million-Dollar Program.—The tremendous program contemplated by the Union Electric Light & Power Company of St. Louis was indicated by President Louis H. Egan in a recent address, when he announced that the company planned to expend $100,000,000 in the St. Louis district within the next six years. The company, he said, will spend $5,000,000 additional on the Cahokia power plant during 1924. Already $12,000,000 has been expended on this plant, which is only one-third its eventual size. Completed it will represent an investment of $35,000,000 and will involve double that amount in cables, conduits, transformers, substations and other equipment. "Perhaps it may seem still more startling to you," Mr. Egan concluded, "when I say that if the demand of this district continues to increase at its rate of the past twenty years, even with gigantic Cahokia completed we shall face the necessity of building almost immediately another plant of like proportions—a second superpower plant."

Progress of Wabash River Plant.—The American Public Utilities Company, which is building near Terre Haute, Ind., the superpower plant for the Indiana Electric Corporation and the Central Indiana Power Company, announces that it is about ready to start the operation of the first 20,000-kw. steam turbo-generator and expects to have the second unit of the same size in operation by April 1. The third unit will be installed during the present calendar year, if it proves possible for the manufacturers to complete construction and make shipment by that time. The fourth 20,000-kw. unit will probably have to be installed next year, and the last one of the same size not later than the early part of the following year. This will provide 100,000 kw. capacity at the Wabash River plant, in addition to the seventeen or eighteen other plants of the Central Indiana Power Company scattered over the territory served. The station, which will burn coal mined on the spot, will operate on 2 lb. per kilowatt-hour.

Pacific Coast A. I. E. E. Convention Plans.—Plans for the 1924 Pacific Coast convention of the A. I. E. E., to be held in Pasadena, Cal., in the week of October 13, are well under way and several important papers have been promised already. This year's convention will take on more of a national aspect than heretofore, and it is planned to bring out an expression of views on Pacific Coast problems from eminent technicians of other sections. The million-volt laboratory at the California Institute of Technology, at Pasadena will be completed before the time of the convention. The convention committee is headed by Prof. R. W. Sorensen of that school.

Utility Association Secretaries to Meet.—A conference of public utility association secretaries will be held at the Hotel Sherman, Chicago, March 25. The purpose of this association is to bring out respective experiences of organization work which may be mutually beneficial to all the electrical utility associations. The tentative program is as follows: "Conventions—Locations, Advertising, Exhibits, Program, Entertainment," D. L. Gaskill, Ohio; "Publications for the Membership"; "Relations Between Associations and State Commissions," Alexander Forward, American Gas Association; "Co-operation with Educational Institutions," J. N. Cadby, Wisconsin; "Speakers' Bureau Activities," R. V. Prather, Illinois; "Committee Activities, How Organized and Maintained"; "Co-operation Between Association Secretaries and Public Utility Information Bureaus," Labert St. Clair, American Electric Railway Association; "Methods of Building and Holding Membership," E. N. Willis, Texas; "Trend of Legislative Matters"; "Need of Supplying National Associations with Information Concerning Local Association Activities."

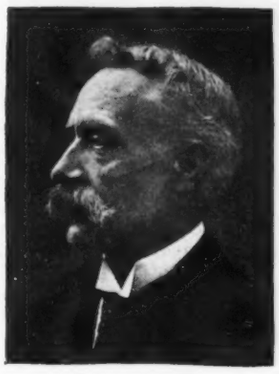
How Montreal Light, Heat & Power Finances Extensions.—In the *Financial Post*, published in Toronto, appears this dispatch from Montreal anent the expansion plans of the Montreal Light, Heat & Power Company and how they are financed: "Arrangements have been made to add another 20,000 hp. to the capacity of the Cedars Rapids plant, bringing the total of the energy produced there to 220,000 hp. It is significant that a few years ago the ultimate capacity of this plant was placed at 180,000 hp. This means that Montreal Power will have a total of 350,000 hp. available, including the production of its own Cedars Rapids, Chambly, Lachine and Soulanges plants and the 85,000 hp. purchased from Shawinigan. Montreal Power is continually making such extensions as these without additions to its fixed charges. It sets up annually a goodly depreciation reserve, and from this amounts are charged off to provide for the entire write-off of depreciated and discarded portions of the system. For instance, in the past year $1,600,000 was credited to depreciation, and approximately $1,000,000 was charged off the account for old properties. This meant $1,000,000 for investment in new revenue-producing equipment, $1,000,000 upon which neither interest nor dividends need be paid."

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

Frank Bailey, British Consulting Engineer

Frank Bailey, engineer with the City of London Electric Lighting Company, Limited, London, England, entered upon his career as a mechanical engineer in a general foundry where colliery engines, pumping engines and other plant equipment were constructed. After spending some years in the workshops and drawing office and attending an engineering college in the evenings, Mr. Bailey became identified with a civil engineer's office, learning surveying, leveling and construction generally. When he had completed a two-year course of instruction in electrical science he was appointed to the post of engineer to the newly formed electric lighting department of the Telegraph



FRANK BAILEY

Construction & Maintenance Company at East Greenwich, working in close contact with the late J. E. H. Gordon, who had designed the largest electric generator in existence at that time.

During his connection with the Telegraph Construction & Maintenance Company Mr. Bailey engaged in design work and in investigating problems connected with distribution, and in 1884, when a contract was made with the Great Western Railway Company for the lighting of Paddington Station and the adjoining stations of Royal Oak and Westbourne Grove, he became intimately identified with the project. In 1887 Mr. Bailey joined Mr. Gordon in forming the Whitehall Electric Supply Company, which one year later was absorbed by the Metropolitan Electric Supply Company. With the latter Mr. Bailey affiliated himself in 1889, carrying out the erection and equipment of generating works at Sardinia Street, Ratbone Place, Manchester Square and Amberley Road. In 1895 he was requested to take charge of the undertaking of the City of London Electric Lighting Company, and by special arrangements between that organization and the Metropolitan company he continued to act for both. He became engineering director of the Metropolitan company in 1896, but severed his connection with the company in 1912 and joined the board of the City of London Company.

Samuel Insull, president of the Commonwealth Edison Company, Chicago, arrived in New York late this week previous to sailing for England on a short business trip. Mr. Insull will remain abroad about a month, returning to this country early in April.

Thomas A. Edison left his home in West Orange, N. J., on Monday, February 25, for a vacation in the South. Mr. Edison is planning to spend two months in his winter home at Fort Myers, Fla.

J. F. Ramier, formerly connected with the Memphis (Tenn.) Gas & Electric Company, later a co-receiver of that company and since January, 1923, a director and vice-president of the Memphis Power & Light Company, has recently resigned his position to enter business for himself. The resignation is effective March 1. Mr. Ramier will continue as a director in the company.

C. L. Proctor, general manager of the Empire District Electric Company, Joplin, Mo., and second vice-president of the Missouri Association of Public Utilities, will serve as acting president of that association during the remainder of the fiscal year. H. C. Blackwell, president of the association, recently resigned upon becoming vice-president and general manager of the Union Gas & Electric Company, Cincinnati.

Charles W. Bradley, who has been assistant to the president of the Public Service Company of Northern Illinois for the last year, has been elected a vice-president of the company in charge of public relations and advertising. Mr. Bradley came up through the gas field, but in recent years has been giving his attention particularly to employee and public relations of both the gas and electric branches of the Public Service Company. In his new position he will be better enabled to carry on these activities. Mr. Bradley began service in the utility field in 1897 with the People's Gas & Coke Company and became associated with the Public Service Company of Northern Illinois in 1905.

G. W. Skow, who has been manager of the Coal District Power Company, Huntington, Ark., which is controlled by the Albert Emanuel Company, Inc., New York, has been made general manager of the Choctaw Power & Light Company, McAlester, Okla., recently ac-

quired by the same interests. Mr. Skow is succeeding J. C. Chestnut, who is remaining at McAlester temporarily, awaiting a transfer to some other property of the Albert Emanuel Company.

H. C. Mackay, who has been treasurer of the Wisconsin Railway, Light & Power Company, La Crosse, Wis., for many years, has recently assumed the duties of secretary of the company, succeeding William M. Chester, resigned. He will retain the treasurership.

Samuel G. Dunham, who retired from the presidency of the Hartford (Conn.) Electric Light Company, as was announced in last week's issue of the ELECTRICAL WORLD, remains with the company as chairman of the board of directors. Mr. Dunham became chief executive in 1912, when his brother, the late Austin C. Dunham, retired.

William C. Bingham, for fourteen years with the Buffalo General Electric Company in various positions from bookkeeper to chief accountant, has been elected assistant treasurer of the company. Mr. Bingham has been active in association work and for a number of years has been a member of the merchandise accounting committee of the National Electric Light Association.

Jacob D. Von Maur, superintendent of distribution of the Laclede Gas Light Company, St. Louis, has resigned to take a similar position with the Consumers' Gas Company of Toronto, Canada. Owing to his new connection Mr. Von Maur resigned the first vice-presidency of the Missouri Association of Public Utilities, where he was also chairman of the committee on rules regulating electric, gas and water service and representative on the calorific standards committee of the American Gas Association.

C. V. Sorenson, who recently resigned as division manager of the Wisconsin-Minnesota Light & Power Company's properties at Rice Lake, has affiliated himself with the Central Indiana Power Company, a subsidiary of the American Public Utilities Company. Mr. Sorenson will be in charge of one of the company's electric plants near Indianapolis. The statement that Mr. Sorenson had become associated with the Attica (Ind.) Light & Power Company, which appeared in the February 23 issue of the ELECTRICAL WORLD, was made in error.

Louis D. Gibbs, superintendent of the advertising department, Edison Electric Illuminating Company of Boston, has been appointed assistant head of the Bureau of Public Relations, recently established at the executive offices of the company. Mr. Gibbs is widely known in the central-station field. He is a past-president of the New England Division of the National Electric Light Association and a past-vice-president of the national organization. He has been for years a vigorous advocate of sound internal relations within the electrical industry and an enthusiastic champion of progressive commercial development and good public relations. He is at present national chairman of the N. E. L. A. committee on public speaking. Mr. Gibbs will maintain his jurisdiction over the advertising work of the Boston company in his new post.

A. W. Fox General Manager of Billings & Spencer

Arthur W. Fox, vice-president and general manager of the Johns-Pratt Company, Hartford, Conn., was elected vice-president and general manager of the Billings & Spencer Company, hardware manufacturers of Hartford, at a recent meeting of the board of directors. Although Mr. Fox assumes the duties of his new office on March 1, he will not sever his connection with the Johns-Pratt Company until another executive shall have been selected to succeed him. Mr. Fox became associated with the Johns-Pratt Company seventeen years

A. W. Fox

ago as a clerk and advanced consistently through the various departments to the position of assistant treasurer. In 1921, when the secretary of the company resigned, Mr. Fox took his place. His promotion to the office he occupies at the present time, vice-president and general manager, followed in the fall of 1922.

D. Newton Barney, who has been treasurer of the Hartford (Conn.) Electric Light Company, was elected a vice-president of the company at a recent meeting of the directors.

J. G. Corrin, who has been sales manager for the Pittsburgh Transformer Company, Pittsburgh, has been placed in charge of the company's San Francisco office.

Ray Fields of Elyria, Ohio, has assumed the duties of distribution superintendent of the Alliance district of the Ohio Public Service Company. Mr. Fields is succeeding E. H. Billman, who spent six years in that capacity at Alliance.

Harry J. Walsh, who for the past year was assistant to Director Lane of the electrical industry's Joint Committee for Business Development, has been appointed assistant publicity manager of C. Brandes, Inc., New York, manufacturer of "matched tone" radio headsets and the Brandes "table talker." Previous to his connection with the Joint Committee for Business Development Mr. Walsh was for several years on the editorial staff of the *Electrical Record,* and he was news editor of that publication just previous to his connection with the Joint Committee.

Robert F. Bohn, who has been associated with the engineering department of the Southern California Edison Company, Los Angeles, for several years, has affiliated himself with the Southern Sierras Power Company as assistant engineer in the Imperial district.

Waldo G. Paine was recently elected vice-president and general manager of the Spokane & Eastern Railway & Power Company and of the Inland Empire Railroad, Spokane, Wash.

Charles Eisler of the Eisler Engineering Company of Newark, N. J., sailed on the *Rochambeau,* Wednesday, February 20, for an extensive business trip to Europe. Mr. Eisler is well known in the electric incandescent-lamp industry.

E. S. Schofield, formerly connected with the engineering department of the Washington Water Power Company, Spokane, has been made assistant industrial engineer in the sales department.

R. L. Bossard, formerly construction engineer with the J. G. White Engineering Corporation, is now associated with the Duquesne Light Company as distribution engineer.

Arthur J. Gowan, formerly a designing engineer in the electrical condenser section of the General Electric Company, Lynn, Mass., has received an appointment as engineer in the electrical division of Stone & Webster, Inc., Boston.

R. C. W. Libbey, for more than fourteen years with the Simplex Electric Heating Company, Cambridge, Mass., and for the past four years stationed on the Pacific Coast, has been appointed representative for Landers, Frary & Clark in Montana, Idaho and Utah.

John E. Lynch, secretary of the Hartford (Conn.) Electric Light Company, was made treasurer of the company at a recent meeting of the directors to succeed D. Newton Barney, who was elected a vice-president. Mr. Lynch became identified with the company in 1897 and was made secretary in 1909. He will continue to perform the duties of secretary in addition to assuming the responsibilities of treasurer. Mr. Lynch is also associated with the Connecticut Power Company as a director.

Edward F. Wickwire, secretary of the Ohio Brass Company, Mansfield, Ohio, was elected a vice-president of the company at the annual election of officers held on Friday, February 15. Mr. Wickwire has been associated with the organization since 1903, when he was placed in charge of sales in the Middle West territory. For several years past he has been secretary. Mr. Wickwire was previously connected with the Sterling Supply & Manufacturing Company of New York, manufacturer of railway specialties, which absorbed the Meaker Manufacturing Company of Waukegan, Ill., changing its name to the Sterling-Meaker Company. Following the merger Mr. Wickwire became secretary and general sales manager, from which position he resigned to affiliate himself with the Ohio Brass Company.

Commission Rulings

Flat Rates Again Condemned.—Ordering the Ironton Milling & Light Company to install meters as a condition precedent to increased rates, the Wiscosin Railroad Commission said: "Flat rates for electric service, under which a merchant with a store or a consumer with a large house pays no more than the small consumer, and under which the charge for stores and large residences is so low that it does not meet the cost of production, are unjust, unreasonable and unjustly discriminatory, and such rates induce the careless use of electricity."

Enforcement of Contract and Guarantee of Revenue.—In demanding that the New Jersey Power & Light Company be forced to make certain extensions, the township of Roxbury and another charged it with failure properly to live up to the terms of a contract. The New Jersey Board of Public Utility Commissioners, while holding that contract violations must be settled in the courts, ordered the extensions conditionally, on the stated principle that orders requiring extension of electric service should be based upon a guarantee of reasonable revenues when the probable revenues would not assure the company a sufficient return to warrant construction.

Effect of Irrigation Development on Valuation.—In valuing that portion of the property of the Idaho Power Company situated within Oregon, the Public Service Commission of the latter state dwelt upon the effect of irrigation development on valuation, saying: "The predecessor companies of the applicant in searching for use for surplus power became interested in obtaining power loads as a result of the development of large irrigation projects using electric power for pumping. The contracts for the delivery of such surplus power were renewable at the option of the consumer. The economic development of large areas of irrigable lands in Idaho and Oregon were and now continue to be on rates for electric power for pumping that are below the rates for power for ordinary purposes. From a small use of the surplus power of the summer the demands for irrigation pumping service had so grown on the date of valuation, December 31, 1919, that with the superimposed demands for other service the applicant was confronted with a most difficult task in financing and constructing additional plant facilities needed during the summer only. The development of the demands for irrigation pumping had for several years past thrust the delivery of this service out of its normal and economic position, as a by-product use of the otherwise unused plant facilities, to a position where there was required a large expenditure for plant facilities and capacity that cannot be used at the other times of the year. In any event additional summer demands should not be encouraged until this unbalanced condition is corrected as much as the related economic conditions warrant. For this purpose both commissions have already allowed a material increase in irrigation power rates for those demands for additional irrigation power made subsequent to 1920. This utility having encouraged the development of this kind of load is not free from the responsibility which is thereby entailed. The present owners of this reorganized company were, or should have been, fully cognizant of the effect on value of a system loaded down with this type of service and the very apparent necessity of its continuance. We, consequently, concur with the Idaho commission in its conclusion that the so-called excess investment for irrigation power, amounting to $1,542,095.89 as of December 31, 1919, is not now entitled to a full return. The investment for the same purpose made since that date has been required by the communities served with knowledge of the obligations in the matter of reasonable rate of return. At such later date as gravity irrigation or other source of power releases portions of this investment from this low-value class of service, it will become available for, and should be devoted to, service capable of yielding a full rate of return." The commission fixed the total value of the company's Oregon property as of June 30, 1923, at $16,182,320.

Futility of Rate Comparisons.—The mere inspection of two schedules is absolutely useless for any purpose other than as a provocation to inquiry, in the opinion of the Board of Railroad Commissioners of Montana, and the integrity of the offered scale depends upon many elements. Adjudicating a complaint brought against the Great Northern Utilities Company, the board said: "Primarily, the reasonableness of the offered schedule with respect to the service for which it is prescribed must be *prima facie* established, and then, before any two schedules can be intelligently compared, every element producing or affecting them must be exposed. It is not enough that the towns compared are of nearly like size in population, for the utility in town A may possess twice the number of customers of the utility in town B, and the greater number of customers may, because of the presence of foreign elements in the population or adverse industrial conditions, demand less of the commodity or service than a smaller group of customers. Again, there is great diversity in the amount of capital invested in various communities, and often present the question of over or undue investment. That the investment in plant and equipment may be substantially equal, however, in both towns counts for little if operating conditions affecting revenues and expenses are at a wide variance, due to labor and material costs. Again, operating costs may approach each other in figures, and on similar investments, without reference to efficiency and economy in management. . . . As a matter of practical administration the superficial comparison of rates in one locality with rates in another locality has been productive of no small amount of mischief in that it breeds utterly unfounded suspicions of favoritism or other unfair advantage." The board observed that although comparisons had been of material aid in the study of railroad rates where a rate can seldom be considered in and of itself, intrinsically there is little place for rate comparisons in the case of electric, gas, and like services.

Recent Court Decisions

State Tax on Street Railways Upheld.—That the Washington state tax upon street railways is not discriminatory nor confiscatory has been established by the United States Supreme Court's decision adverse to the Puget Sound Power & Light Company and the city of Seattle in their suit against the County of King and others. The company sold its street-railway lines to the city in 1919. Prior to the sale state and county taxes had been assessed. The city joined the company in resisting the tax on the ground that it was assessed on a higher basis than in the case of other property. The Supreme Court found nothing illegal in the method of assessment.

Sale of Surplus Power for Private Use Not Subject to Public Regulation.—Electrical energy produced by a company which is not required for present needs of a public service may reasonably be called surplus, and its sale to private parties for power purposes is not subject to regulation by the Public Service Commission of Washington, according to a decision of the United States District Court in Puget Sound International Railway & Power Company vs. Kuykendall. This company under its franchise in the city of Everett furnishes light for buildings and residences and power for the operation of the street railway and municipal pumping. These services were admitted to be public. It also sells power for heating and manufacturing purposes to individuals and private corporations. This business the plaintiff contended was private and defendants that it was public. No claim was made that the latter two uses or purposes are different in any respect, under the principles of law applicable. In rendering its decision for the plaintiff and denying the commission's power to regulate rates for the consumers not concerned in the franchise, the court, which thereby sustained decisions of state courts, also observed that the fact that the jurisdiction of a federal court is invoked on the ground that the action of a state commission is in violation of the federal Constitution does not require the court to ignore state decisions respecting the powers of the commission and to determine the question as one of the federal law alone. (293 Fed. 791.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

Textile Industry Still an Attractive Electrical Market

BY A MANUFACTURER

SPOTTY conditions in the textile industry accompanied by uneven buying of electrical apparatus and supplies have raised the question in many quarters as to how promising from the electrical viewpoint the present and early future market here is. This great industry is to a large degree concentrated in New England and scattered through the South Atlantic States, and at present the former section is undergoing severe competition from the latter, particularly in the production of the lower-priced cottons. Curtailment of the order of 50 per cent capacity is widespread in New England cotton-manufacturing circles, although the South is by no means free from it, the high price of cotton proving a handicap in both sections.

Notwithstanding the drawbacks of unequal legislation regarding the hours of labor North and South, the relatively easier conditions South with respect to union restrictions as compared with the North and the advantages of handling personnel in smaller groups, the outlook is by no means as dismal as many writers contend. Well-informed opinion in electrical manufacturing quarters supplying machinery and other material to the textile trade holds that economic differentials between sections tend to become equalized, and that in the long run each section of the country will make a success of that work for which it is best fitted. The advantage of nearer location to the cotton fields is often exaggerated in the South. Skilled labor and superior climate favor the North, and as regards overhead, many of the Northern mills were built at low costs which cannot be duplicated today in the Southern areas. To assert that any general exodus of mills from one section to the other is a reality would be to exaggerate grossly the present situation.

The electrical manufacturer and the central-station man need not worry about competitive conditions within the textile industry, for the applications of electricity in this great field of service tend to increase economies of operation and to decrease the costs of unit production everywhere. The textile industry is a truly national electrical market. Great difficulties under which textile manufacturers labor today are, broadly speaking, to be alleviated and in many cases cured by the application of electrical service. The introduction of the motor drive into a single mill increased production 7 per cent and turned the scales financially for the establishment from operation at a loss for three years running into operation at a good profit. The advance of modern illumination is another factor which is only at its beginning in its influence upon production conditions, and recent developments in industrial electric truck and tractor equipment have put new tools in the hands of the textile manufacturer for the economical and expeditious movement of his products and raw material in both horizontal and vertical planes.

The economic advantages of central-station service are becoming better appreciated and spell increased efficiency in the use of mill capital and supervision of business and manufacturing affairs. From just about every angle the electrical industry is in a strategic position to help the textile industry to turn out its products at lower unit cost and to improve its quality of output. The electrical industry has done much in this direction and will do more.

The Jobber in the Kitchen Light Campaign

Some Interesting Evidence from the Experience of the Syracuse House of the Robertson-Cataract Electric Company

THE growing interest of central-station companies in the development of home lighting through an attack upon the kitchen appears to be opening up an interesting opportunity for the extension of the electrical jobber's service to the manufacturer. The kitchen-lighting unit provides an entering wedge into this great underdeveloped field, and phenomenally successful campaigning by a large number of central-station companies has proved that here is a commercially practicable scheme for making the pioneering of this market profitable, not only to the service company but to the manufacturer. The Syracuse house of the Robertson-Cataract Electric Company of Buffalo, N. Y., has conceived the idea that the jobber also might contribute an important service in this work, recognizing that such a commodity as the kitchen light offers to the jobber an opportunity of real value for the extension of its influence as a wholesale distributor.

"Manufacturers have in the past been instrumental in promoting plans, campaigns, sales drives or whatever you wish to call them, either through a jobber or directly through dealers, in order to dispose of their products," says Frank S. Smith, manager of the lighting department. "It has occurred to some of the more progressive jobbers that possibly this activity on the manufacturer's part could be even more effectively promoted by the jobber himself than by the manufacturer if the electrical supply house would go through with the job of selling by promoting and following through merchandise-moving ideas, developing new sales ideas and applying to its own conditions and territory some of the sales ideas of more fertile brains—in a word, selling not only merchandise but ideas.

"The manufacturer at long distance attempts, by general circularization, to promote interest in an idea—for instance, in better lighting in the kitchen. He sends out an attractive circular or broadside and in the course of weeks or months

has his representative call to follow up this attractive circular, which has been filed in the waste-paper basket some time ago. We will assume, however, that interest is aroused in the kitchen-lighting idea again and that the central-station company decides to put on a campaign. Then it looks around for other better, maybe less expensive, units. In the meantime the representative travels on and tries to keep in touch with the central station by mail. The result needs no explanation or analysis.

"In contrast with this, the progressive jobber may accumulate information from all the manufacturers and formulate a working plan which may be turned over to the prospective customer in such shape that it looks acceptable to him. It is much more apt to be acceptable because it takes into consideration the prevailing conditions in the vicinity of the central station, whereas the manufacturer's proposition must be general and consequently, too often, only partially applicable. The jobber has his representative call often. He carries the stock at a convenient point. He is situated in the midst of these central-station customers and he needs every one of them. He must keep the customer satisfied because his business depends on that. He will, therefore, go through with this campaign along with the central station, because he originally promoted the idea, brought it to the attention of the central station and consequently must see that it is carried to a successful conclusion.

"For the jobber should be more than a source of supply. He must first be a clearing house where the workable and salable ideas are separated from the other ideas presented by various manufacturers. After separating these ideas he must make some definite plan to put them into effect. This does not require any extraordinary executive ability or initiative, but merely an inclination to be instrumental in rendering the best and most satisfactory service to the customer."

KITCHEN UNITS AS A CASE

Acting on this principle, the Robertson-Cataract Electric Company developed a very definite plan and proposal on kitchen-lighting units and went to work to interest the larger central-station companies within its territory. A manual was prepared to present the plan. The subject was brought before the organizations of these central stations in open meetings. In several cases, after they had accomplished all of the preliminary work and sold the idea and the customer was prepared to buy, it developed into a detail of their purchasing departments, and then all there was to the kitchen-unit idea was a piece of brass, a piece of glass, a receptacle and a switch, whereupon the five-and-ten-cent jobbers got in their work and in a few cases fell heir to the business that the Robertson-Cataract men had initiated. But many campaigns have been carried through. In one city the central station has purchased more than

TYPE OF ADVERTISEMENTS DEVELOPED BY THE JOBBER IN SUPPORT OF KITCHEN LIGHT CAMPAIGNS

2,000 units and added in the neighborhood of $4,000 to net income, and this utility will extend the campaigning to a number of smaller cities that it serves. Another central station has purchased 1,500 units, another 500, and still another in an important city of central New York has been so moved by the plan that it has decided to start a campaign and contract for 4,000 units.

SOME PRESENT DIFFICULTIES

"Since the decision of this last company," writes A. M. Little, general manager of the Syracuse branch of the Robertson-Cataract Electric Company, "it has been bombarded with sample kitchen units from all parts of the compass, and I presume if it waits long enough it will have enough samples on hand to give it a good start on the campaign. This same thing applies to prices, and perhaps in the end some one may present the company with the unit in order to obtain an order for the receptacles at a 2½ per cent profit. The main thing, however, is that the company considers a campaign good business and is going through with it.

"The electrical jobber must take the initiative in starting and carrying through campaigns. We are doing this now all the time on appliances and expect to do it to an increasing extent on other material. The day has gone by when an electrical supply jobber can attain any great volume unless a service is rendered that goes entirely beyond the furnishing of the material at a price and the collection of the bill. Jobbers not prepared to render this service will, in my opinion, if they are wise, content themselves with small things and refrain from reaching after big business. I am saying nothing here about the extra remuneration a jobber rendering this service should receive, or the net profit such jobbers may make on such sales, because that will disclose a defect in the business that time alone will correct."

Move to Standardize Construction Equipment

LETTERS are being sent to equipment manufacturers by the Associated General Contractors outlining a proposal to create a "manufacturers' bureau" of that organization to include both producers and consumers of construction equipment, in order to handle questions of standardization of specifications and other matters of common interest. This action is in line with a request from prominent manufacturers submitted to the executive board of the Associated General Contractors at Chicago last month. The association also has under consideration broadening the proposed new work to include in the bureau some manufacturers of construction materials.

All interests apparently recognize the need for standard specifications, and the suggestion has been made to the Associated General Contractors, as representing the consuming interests, that a bureau under its general direction could accomplish much in this direction. While all details will not be settled until the views of the manufacturers are known more fully, the idea has been advanced that the contractors should state their needs as to clarity of specification in the various lines of equipment, then bring in the manufacturers to work toward agreement which would satisfy these needs. Standardization of capacities is said to be the outstanding need.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

A QUIET week has been experienced in the electrical trade, although the volume of business is generally good throughout the country. It is an interesting feature that, though there is a distinct absence of conspicuous activity, there is a very strong spirit of optimism and a general confidence both in the existing condition and in the outlook. This general feeling is perhaps grounded on two distinct factors. First, it is well known that manufacturers of large turbines and generating equipment are sold out for more than twelve months in advance, and central-station construction and expansion have proceeded throughout the winter at an almost unprecedented rate. This is an absolute index to a large volume of business to come. Second, the general condition of stocks over the entire country was extremely good at the end of the year, and continued buying throughout the market to take care of the ordinary demands of business is assured. Therefore, what might be considered a cautious attitude on the part of purchasers is really becoming a factor of stability.

In the New England district electrical machinery sales are reported in good volume, and although cotton textile makers are contributing little to the electrical industry, the metal industries are active and have stimulated a fair demand. Central-station purchasing continues to be the center of activity in the New York district, while volume of sales in other lines is considered good. The Southeast reports an increased industrial activity, with the expected electrification of mechanically driven plants attracting attention. There is continued activity in industrial equipment and supply lines in the Middle West and central-station buying is brisk. On the Pacific Coast the volume of business is good for the present, although the continued drought is beginning to create alarm.

Demand Becoming Greater than Supply on 8-In., 35-Ft. Poles

THE demand for 8-in., 35-ft. Western red-cedar poles has become so great compared with the proportion of poles of this size which can be taken out of timber land that some producers are experiencing difficulty in supplying them. They expect even more difficulty in the future if buyers do not spread their demands over other sizes not so much in demand. Buyers have evidently forgotten or do not recognize that poles are a nature-grown product and must be taken in the proportions in which they grow. Yet so insistent is the demand for this size of pole that some producers have been compelled to cut 8-in. 40-ft. and 45-ft. poles down to 8-in., 35-ft. lengths, thereby wasting timber and increasing the cost.

Pole producers suggest that buyers can alleviate the situation considerably and profit by better deliveries without materially sacrificing pole strength by ordering neighboring sizes, say the 7-in., 35-ft., or class C-35, pole. Buyers are warned, however, not to let the relative shortage of 8-in., 35-ft. poles induce them to rush orders for this size to protect themselves; otherwise the same situation which occurred a year ago will result when buyers, fearing a shortage, flooded the producers with orders which they were unable to handle and which deprived the most needy users of the poles they required. The supply of 8-in., 35-ft. poles is no shorter than last year, and the producers can continue to furnish them if buyers do not increase in proportion the number which they demand.

The chief point made is that where users can employ a 7-in., 35-ft., or class C-35, pole in place of an 8-in., 35-ft. pole they will benefit by reducing the demand on what is at present the size under greatest demand. Furthermore, buyers are urged to make a survey of their pole needs for some months to come and to advise distributors so that deliveries can be scheduled over a greater period of time instead of being bunched with appeal for immediate shipment.

Tape Market Disturbed by Low-Quality Material Offered

MANUFACTURERS of high-grade tapes of the friction type closed the year with plant machinery fully employed and today are operating on a fairly good schedule in the face of low grade competition. In well-informed circles emphasis is still strong upon the tendency of many distributors and ultimate consumers to buy adhesive tape purely on a price basis. Few items in the long list of active electrical supplies appear to be purchased in so offhand a manner as is tape, and while no little trouble has been experienced from the failure of low-grade products in service under severe conditions, prominent sales managers point out that thus far users and distributors have shown too little interest in the quality problem. Repeat orders and some new ones, to be sure, are swinging in more cases to the houses with reputations for first-class goods, but there is still a small army of wiring contractors and a considerable corps of jobbers to be enlightened as to the importance of tape quality.

Deliveries have been good for some time and factory stocks have contributed to this. A demand for more high-grade American tape has lately arisen in England, France, New Zealand and Australia. The opinion is current that if purchasers in 1924 will concentrate more attention upon quality material, the consumer will be the gainer in the long run and the manufacturing side of the industry will attain a desirable degree of stabilization.

Heavy Turbo-Generator Demand Index of Future Buying

THE three principal builders of large turbo-generators (20,000 kw. and over) long ago sold out their entire possible output in these larger sizes for the year 1924. They are not quoting deliveries earlier than the late spring of 1925. This situation is, of course, no news to those who are in the market for these larger turbines. Its principal importance is taken to lie in the indication it affords as to the demand for other equipment during the next two or three years.

Manufacturers who are keeping an eye on future buying recognize that for every dollar invested in generating equipment there are four or five dollars to be invested in auxiliary and distribution equipment, purchases in this line generally lagging from six months to a year behind the purchase of generating equipment. As a principal executive of one of the larger companies recently asserted, judging from the volume of generating equipment sold last fall and being sold this year and to be ordered for early 1925 delivery, the demand for equipment which lags behind the generating equipment is going to be very heavy for the next two or three years.

Panelboard Deliveries Are Shortening Slightly

THE recent movements in raw-material prices have left little impression upon panelboard manufacturers, since representative establishments state that they must plan far ahead of demand in the accumulation of workable stocks and many weeks are often required for a price change in copper or panelboard material to dominate factory inventory figures. The market conditions in this field are good and both price and cost conditions reasonably satisfactory. At the moment there is a slight droop in the curve of new business, but the outlook is promising and a large volume of back orders remains to be completed before the spring demand sets in.

Another big year of expansion in the building industry is expected, and this will have its inevitable reaction upon the sale of panelboards. Factory stocks of panelboard parts are being well maintained; prices for the time being at least are stable, and, slowly but surely, a tendency toward the standardization of panels is making itself felt. The open winter has been very satisfactory from the freight and express standpoint, so that deliveries are being steadily improved.

High-Tension Fuses and Lightning Arresters Active

AN INCREASING demand for the carbon-tetrachloride type of high-tension fuses is reported by both the manufacturer and distributor. The market has been so good during 1923 that one manufacturer has recently doubled his factory floor space, since this business now runs over 30 per cent of his total volume. The principal demand ranges from 6,600 volts up to 33,000 volts. Moreover, along with the

increase in farm-lighting transmission systems has come a larger demand for fuses rated up to 25,000 volts.

The tendency of designing engineers seems to be increasing toward the use of higher voltage fuses. Equipment to operate at 154,000 volts is now being produced, and it is difficult to determine just where the limit in larger-voltage fuses is to occur. Since it is only necessary to lengthen the fuse and increase the fusing capacity, it would appear that a demand for still higher voltages will be met without much difficulty from a production standpoint. After several years of educational work directed toward securing the return of all blown fuses to be refilled at the factory, utilities are now seeing the error of filling them in the field. Several Australian companies now are making a practice of sending their blown fuses back to the States twice a year.

Deliveries are very much improved. Tetrachloride fuses can now be obtained within a shorter period than existed last fall as a result of increased manufacturing facilities and the fact that this period of the year is the low point of transmission and substation construction. Where formerly fuse equipment could not be shipped within six weeks, deliveries now run about two weeks or even better. Prices have not changed for a long period and there are few indications that they will. The same delivery situation applies to high-tension lightning arresters also, especially the graded-resistance type, shipments being more prompt than during the peak period last fall. However, the porcelain scarcity is still worrying these manufacturers, and although the present situation is much better, owing to larger stock, a recurrence of last year's rush for porcelain is expected when the active spring buying commences. Buyers who can schedule their requirements for 1924 may well get in closer touch with the manufacturers to avoid the delays that are likely to occur later in the year.

Central Station Buying Brisk in Middle West

THE demand for circuit breakers in the Middle West stands out as the most important item of the week, with several manufacturers reporting the receipt of excellent orders. Central station buying is active and there is every reason to believe that this activity should continue for some time. A single order for transformers totaling $85,000 was entered this week, the demand being considered normal. Favorable weather conditions have permitted construction work to progress, with the result that the demand for building supply lines and pole line material are active.

There is continued activity in industrial equipment and supply lines, the demand being met on an extremely competitive basis. The armored cable market continues to be demoralized, reductions are noted and distributors are quoting carload prices in any quantity. Very attractive offers are being made on artificial silk and pure silk lamp cord due to a manufacturer having discontinued this line. The rumored advance in code wire has not been announced, although it is reported that one manufacturer has increased prices. Distributors have been placing their usual fan requirements and it is anticipated that the demand this season will even surpass last year.

Business Good on Pacific Coast—Drought Creates Alarm

THE volume of business on the Pacific Coast at the present time is very high, although the continued drought is beginning to create considerable alarm. In addition the snowfall packed along the Sierras is about one-third the usual height, and as almost no rain has fallen in the productive central valley any serious diminution of farm products would have a marked effect upon the industry. Last year farm products were estimated at more than six hundred million dollars.

Increase in the price of copper has elicited some very big inquiries, one of which from a prominent railroad was for over one hundred thousand pounds. There is a heavy demand from central stations for construction tools, especially pike poles and digging bars, while the lighter tools, such as pliers and climbers and small porcelain material, are moving very well, with an estimated increase of about 20 per cent over the average. The demand for pole-line hardware continues to be good. Among the industrials there has been an increasing demand for certain materials, such as heavy 1½-in.-tip soldering irons and furnace-control transformers, this demand being largely due to continued sales efforts along these lines.

Radio business is quiet in the country, but very good in the coast cities, particularly in Los Angeles, where a remarkably well-attended radio exhibition was recently held. Future electrical construction work on industrial and residential lighting is showing a very large volume, but at exceedingly, and in some cases ridiculously, low prices, due to extremely competitive conditions. It is interesting to note that there is a gradual shifting of the character of business through such new tendencies as candle-type lighting and such innovations as "elexits," while illumination standards which have been recommended and adopted are receiving the full indorsement and support of the public.

Business Quiet but Satisfactory in New York District

ALTHOUGH business is quiet in the New York district, the general tone of the market is good and there appears to be no room for pessimism. Manufacturers are pushing sales aggressively, feeling that extra effort is necessary and justified in order to get their share of business. The trade is confident, though inclined to caution in buying.

There have been no outstanding events during the week, and although one company reports exceptional sales of industrial equipment, it does not consider that this indicates any upward movement since inquiries are not in proportion. Central-station purchasing continues to be active and materially assists in improving the general condition, while continued building activity has brought distinct strength to the market.

February is usually regarded as a slow month, particularly in the jobbing industry. From the results so far indicated this year, however, daily sales in February were as large as, and in some cases larger than, in January. As far as volume of business is concerned, jobbers report that it has been satisfactory and well diversified. This business for the most part is being conducted on a very small margin, so that it would appear that the contractor today is actually able to purchase on a better basis than before. Recent fluctuations in armored cable are hard to diagnose and can only be attributed to the highly competitive conditions, which are working to the material advantage of the consumer. Further slight increases are noted in copper wire as a natural outcome of the present copper market.

Increased Industrial Buying in Southeast—Building Active

THE expected increase in industrial activities in the Southeast has now so materialized that the sluggishness noticed for the past few months has been replaced by a definite upward movement with every prospect for an unusual volume of business in the spring and early summer. The electrification of mechanically driven plants is attracting considerable attention, and a number are expected to change their type of drive in the near future. Textile and ice plants show the most interests in a change. It is not expected that this work will be much affected by the more or less general curtailment now reported in the operation of Southern textile mills. This temporary setback is the result of a failure of buyers to purchase requirements in the face of what they consider to be too high a cotton market. Predictions are that a 10 per cent to 15 per cent curtailment will be immediately effective, with the curtailment going to possibly 50 per cent in certain lines before the demand is sufficient to warrant full-time operation again. A stiffer market is looked for in the near future.

Building activities in the larger cities continue strong, Memphis reporting a very large amount of construction proposed and under way, with the demand for electric service heavier than for some time past. As a result of this development preparations are being made immediately to install additional generating facilities. Manufacturers' representatives are enthusiastic over the way architects and contractors in this section are receiving their preachments on more convenience outlets, and that their efforts are bearing fruit is proved in the very satisfactory demand for wiring devices that is being reported by jobbers.

Electrical jobbing business in Atlanta is holding up well, with generally good stocks the rule. Prices are stable. The only change reported this week is the announcement by one jobber of an advance of one-half cent a pound on weather-proof wire. Jobbers generally

report their February collections as satisfactory, with some improvement over the previous month in collections from contractors.

Machinery Active in New England —General Market Good

SALES of electrical machinery in the New England district are reported to be in good volume. Industrial electric trucks, which have been showing good sales in other districts, are comparatively slow, but an improvement is anticipated. The cotton textile makers are buying little material from electrical manufacturers, while, in direct opposition, the metal industries are active and have stimulated a fair demand.

An advance of one-half cent per pound on base price of weatherproof wire was recorded at the end of last week, but this is not surprising in view of the copper situation. Prices are firm in all other lines, there being evidence of a very stable condition. There have been a considerable number of orders placed for iron conduit, following rumors of a price increase, although it is doubtful if any increase will take place.

Jobbers in general are busy and have good stocks in most lines except radio apparatus and high-tension insulators. However, high-tension insulator deliveries are improving and current quotations are on a five or six weeks' basis of shipment as against eight weeks recently quoted. Lamp sales are said to be excellent for this season, and appliance sales are continuing ahead of expectations. Plenty of building construction has been projected and many concerns are making estimates on this work.

The Metal Market

THE last week has shown no active demand for any of the non-ferrous metals with the exception of lead, which continues scarce. Copper and tin have been exceptionally quiet and the demand for zinc has not been as great as in the last few weeks.

Copper purchases during the last week have been the smallest for some time. News that Calumet & Hecla and Anaconda had passed their dividends has hardly served to stimulate buying. Small tonnages have sold as low as 13 cents during the past two or three days, with enough being offered to take care of the meager inquiry. The small advance noted to-day is due to foreign dmand, which, however, is not extremely large. The large production continues to be the critical factor, although some curtailment has already been announced.

NEW YORK METAL MARKET PRICES

	Feb. 20, 1924 Cents per Pound	Feb. 27, 1924 Cents per Pound
Copper, electrolytic	13⅞	13¼
Lead, Am. S. & R. price	8.50	8.90
Antimony	11.00	11.00–11.50
Nickel, ingot	28	26–30
Zinc, spot	7.25	7.15
Tin, Straits	54.00	54.875
Aluminum, 98 to 99 per cent	27	27

Activities of the Trade

Devoted to News of the Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Western Electric Offers New Apparatus

The Western Electric Company is now offering two new lines of motors. The type SCR is a line of single-phase repulsion-type motors. Types KT and KQ have been redesigned and are now known as type KT, which is a line of polyphase motors, 40 deg. continuous-duty, riveted-frame type, possessing, it is claimed, many improved electrical and mechanical characteristics. Sizes up to 15 hp. are now available in the type KT motors.

The firm is also offering a new model power and light outfit called the 8-DC and rated at 750 watts, although it is said actually to develop more than 850 watts on a battery-charging run.

General Electric Receives Substation Apparatus Order

The General Electric Company recently received an order for substation apparatus from the Buffalo General Electric Company embracing a 4,500-kw. frequency converter, one 3,000-kva. and one 5,000-kva. synchronous condenser, one automatically controlled 1,920-kw. motor-generator set for supplying a three-wire Edison system, two three-phase, 20,000-kva. transformers, together with a number of smaller transformers, thirty-four feeder regulators and a number of large oil circuit breakers.

Westinghouse Moves Into New Philadelphia Home

The Westinghouse Electric & Manufacturing Company and the Westinghouse Lamp Company have consolidated their Philadelphia sales, service and warehouse departments in a new home at Thirtieth and Walnut Streets, Philadelphia. The new building is ten stories high and is built of reinforced concrete veneered with face brick laid in Flemish pattern. The design and equipment of this building are unusual in that it affords under one roof facilities for executive and sales routine manufacturing, erecting and service departments.

John H. McGowan Company Acquires Twinvolute

The John H. McGowan Company, Cincinnati, has acquired the Twinvolute Pump & Manufacturing Company of Newark, N. J. The McGowan company will add the Twinvolute line of centrifugal pumps to its long-established line of steam pumps. The sale which was recently consummated transferred the entire common stock of the Twinvolute company with all its assets and liabilities to the McGowan interests. The Newark factory is now being moved to the McGowan headquarters in Cincinnati.

John B. Ketcham, who has sold the Twinvolute pumps in New York City for more than fifteen years, has taken over the representation of the Twinvolute line in the metropolitan district. In addition he will handle the new La Bour self-priming centrifugal pump.

Atlanta Electrical Association to Guarantee Work

Members of the Atlanta Electrical Association have agreed to furnish a year's guarantee on all contract workmanship and materials furnished by its members, according to A. G. Stanford, president of the association, and announcement to that effect has been made to the Atlanta public. It was also decided at the last regular meeting of the association that the members shall take an active part in the "Own Your Home" Exposition to be held in Atlanta during April.

M. J. Daley & Company Organized

M. J. Daley, formerly general manager of the electrical department of Fred T. Ley & Company, New York, and H. S. Arnold, formerly manager of the electrical department of the home office of the same company, have severed their connections with Fred T. Ley & Company and have organized the concern of M. J. Daley & Company with the main office at Springfield, Mass., and a branch office at 19 West Forty-fourth street, New York. It is their intention to follow up the installation of both steel and wood transmission lines and the installation of heavy electrical apparatus in power houses and substations.

Radio Corporation to Pay Dividend and Amend Charter

"The Radio Corporation will this year pay the 7 per cent dividend on its preferred stock, which is cumulative from the first of January, 1924," according to an announcement by the president, Major General J. G. Harbord. He further says: "It is anticipated that at the meeting of the stockholders to be held in May the charter of the corporation will be amended so as to reduce the number of shares of authorized preferred stock from 5,000,000 to 500,000 and the authorized no-par-value common stock from 7,500,000 to 1,500,000 shares. The plan is to retain the capitalization of the corporation as at present authorized, but to create a par value of $50 for the preferred stock, to be known as 'A' preferred stock, for which the present preferred stock will be exchangeable at

ten shares of the present for one share of the new stock, and to exchange the present common stock at the ratio of five shares of the present stock for one share of the new or 'A' common stock.

"The dividend rights of the preferred stock over the common stock, and the voting rights of each, will be preserved in this arrangement. After this change is effected application will be made to list the 'A' preferred and the 'A' common stock on the New York Stock Exchange."

Canadian Westinghouse Builds New Foundry

A new foundry having a capacity 30 per cent greater than its old one is being undertaken by the Canadian Westinghouse Company. The present foundry can handle a heavy tonnage of small castings but has not the capacity nor is the building strong enough for turning out large generator castings. The new foundry will be able to handle any casting. An order for $230,000 worth of structural steel for the new foundry building has been placed with the Domininon Bridge Company, Hamilton, Ontario.

Jeffery-Dewitt Insulator Cancels Contract with R. W. Lillie Corporation

The Jeffery-Dewitt Insulator Company, Kenova, W. Va., and the Champion Switch Company, Buffalo, N. Y., an associated interest with the Jeffery Company, have canceled their sales agreements with Raymond W. Lillie and the R. W. Lillie Corporation of New York City. The cancellation of Mr. Lillie's agreement becomes effective May 8, 1924, and that of the R. W. Lillie Corporation's agreement on August 8, 1924.

After the period of receivership through which the Jeffery-Dewitt Insulator Company passed Mr. Lillie became vice-president and general sales manager of that company. During his term of office the company enjoyed a constantly increasing volume of business.

The Western Electric Company has let contracts aggregating $195,000 for materials and their installation at the several units of the company's telephone switchboard and cable works now under construction on its 60-acre tract at Kearny, N. J.

The Robertson-Cataract Electric Company, Buffalo, has purchased a building at 25 Whitesboro Street, Utica, to be used as the new home of its local branch at Utica, known as the Utica Electrical Supply Company.

The Birtman Electric Company, Lake and Desplaines Streets, Chicago, announces that J. M. Beach of E. B. Latham & Company, New York, won the first prize of $500 in the "Bee-Vac" grand national prize contest. It is stated that Mr. Beach sold 194 "Bee-Vac" cleaners and seventy-nine sets of attachments during the period from September 1 to December 31, 1923.

The Sundh Electric Company, Newark, N. J., has appointed Thomas E. Beasley, formerly with the St. Louis office, as manager of the Chicago branch, 122 South Michigan Avenue, to take the place of H. J. Kaufman, who will now devote his time to other offices of this organization.

The Tower-Binford Electric Company, Richmond, Va., has sold to the Powhatan Realty Corporation, for $54,000, property on the northwest corner of Fourth and Cary Streets. The property consists of a two-story brick building in which the manufacturing plant of the electrical company is housed.

The S. Morgan Smith Company, York, Pa., has received an order for three 15,000-hp. waterwheels from the Southern Power Company for use at its new Rhodhiss hydro-electric plant.

The Op-Al Electric Company, Indianapolis, has arranged for the removal of its electric equipment plant to larger quarters at the rear of 1057 West Thirtieth Street.

The American Bridge Company, New York, has secured a contract totaling 1,500 tons of structural material from the Illinois Power & Light Corporation. This material is to be used for steel transmission towers to be installed between Keokuk, Iowa, and Galesburg, Ill.

Henry D. Sears announces that a stock of Weber wiring devices is now carried at 131-139 South Desplaines Street, Chicago, to serve the Western trade better. Paul J. Cratty, Western representative for more than ten years, now becomes Western manager, with his office at the above address.

Chas. Cory & Son, Inc., New York, announce that George M. Marr, for the past four years district manager in Philadelphia, has been transferred to the sales department at the main offices in New York. Robert L. Reaves, formerly electrical engineer at Hog Island and more recently connected with the naval air station at Lakehurst, N. J., has been appointed to succeed Mr. Marr.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., will soon break ground for the proposed addition to its factory branch and distributing plant at 717 South Twelfth Street, St. Louis, to cost about $155,000. It is purposed to have the structure ready for occupancy at the earliest date. Bids are being taken for the erection of a three-story addition to its plant at Powell and Sixty-second Streets, Emeryville, Cal., to cost about $300,000, for which a general contract will soon be let. Bernard H. Prack is company engineer on the site.

The Elkhart Rubber Works, Elkhart, Ind., has brought out a new insulating tape known as "hydro-proof tape," which, it is claimed, has many advantages, especially for outdoor work.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Electric Melting Pot with Automatic Temperature Control

An electric melting pot for melting and maintaining at working temperature soft metals and alloys such as solder, babbitt, lead and zinc has been developed by the Westinghouse Electric & Manufacturing Company. This melting pot, which is made in two sizes, of 150 lb. and 750 lb. capacity, has a thermostatic control that automatically keeps the temperature of the molten metal at any desired point between 450 deg. and 950 deg. F. A small electric motor controlled by a thermostat throws the snap switch on or off as the temperature of the metal reaches the high or low limit set by the operator, which provides an even working temperature without further attention. With the temperature control possible through the use of electricity for heating, the pouring temperature can be very closely regulated.

Oil Engine

A new two-cycle oil engine has been developed by the Bethlehem Steel Company, Bethlehem, Pa., and can now be said to have passed the experimental stage after three years of experience under exacting service conditions. The engine is of the vertical, two-stroke-cycle, single-acting type, constructed in units of four, six or eight cylinders and operating at speeds from 116 r.p.m. down to 90 r.p.m. As the engine is of the two-stroke-cycle type it is said to be very steady in operation. A six-cylinder engine without flywheel has been in regular operation for some time producing alternating current in parallel with gas engines rated at 40,000 hp.

Watt-hour-Meter Mechanism

A distant-dial mechanism for use with watt-hour meters has been developed by the General Electric Company. This device is actuated through a contact mechanism in the register of the watt-hour meter and can be used where it is desired to have the registration of the meter appear at a point remote from that where it is installed.

Oil Circuit Breaker

A line of indoor-service electrically operated oil circuit breakers, known as forms CO-11 and CO-22, has been developed by the Westinghouse Electric & Manufacturing Company. These breakers are three-pole, single-throw, automatic or non-automatic, for capacities up to 2,000 amp. and voltages up to 25,000. It is said that the two outstanding features of this type of breaker are its compactness and its ease of installation.

New Trade Literature

PRECISION TRANSIT. — The Warren-Knight Company, 136 North Twelfth Street, Philadelphia, is distributing a folder covering its "Sterling" precision transits.

CONCRETE POSTS.—The Chicago Concrete Post Company, Lawrence, Lamon and Leland Avenues, Chicago, has issued a new catalog covering its ornamental concrete lighting systems and concrete products.

INDUSTRIAL SWITCHBOARDS. — Bulletin No. 25 issued by the Mutual Electric & Machine Company, Detroit, describes and illustrates its "Bull-Dog" super-safety switchboards, industrial type, model DF-5 dead front, for industrial plants, public institutions, office buildings, etc.

FLOOR-SURFACING MACHINE.—The American Floor Surfacing Machine Company, Toledo, Ohio, is distributing a large folder covering its "American Universal" floor-surfacing machine.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Oran, Algeria (No. 9,265), for electric automobile lamps and all electrical accessories.

Purchase and agency are desired in Chihuahua, Mexico (No. 9,248), for electric appliances, especially household specialties.

An agency is desired in Johannesburg, South Africa (No. 9,215), for electrical devices (small lines).

An agency is desired in Pernambuco, Brazil (No. 9,210), for electrical sundries, including batteries, bulbs, shades and fittings.

An agency is desired in Turin, Italy (No. 9,240), for household electrical appliances and equipment and resistance wire for heating apparatus.

Purchase is desired in Antwerp, Belgium (No. 9,211), for radio parts and apparatus.

Purchase is desired in Valparaiso, Chile (No. 9,257), for welding outfits.

Purchase and agency are desired in Milan, Italy (No. 9,235), for low-priced automatic, hand and electric player pianos.

An agency is desired in Glasgow, Scotland (No. 9,261), for vacuum cleaners and carpet cleaners.

Foreign Trade Notes

PLANS UNDER WAY FOR A HYDRO-ELECTRIC PLANT FOR MONTEVIDEO, URUGUAY. — Plans are being considered by the National Administrative Council for utilizing the waters of the Rio Negro River to generate electricity for the city of Montevideo and surrounding towns. The cost of the project is estimated at 15,000,000 Uruguay pesos (present value $0.79). The project will be financed by American capital and the electrical equipment will be purchased in the United States. Contract for the work, it is expected, will be awarded immediately.

CONCESSION GRANTED FOR NILGIRI (INDIA) HYDRO-ELECTRIC PROJECT. —The government of Madras, India, *Commerce Reports* states, has granted Tata Sons & Company a concession for the Nilgiri hydro-electric scheme. The project calls for the construction of a dam 120 ft. long across the Kundah River, where a head of about 3,000 ft. can be obtained. It is estimated that 20,000 hp. can be developed. The proposed plant will supply electricity in the towns of Coonoor, Wellington, Octacamund and Coimbatore.

AN ELECTRIC LIGHT AND POWER PLANT FOR HONDURAS.—A concern in Honduras has applied to the authorities at Tegucigalpa, *Commerce Reports* states, for a concession to construct an electric light and power plant in an inland town. The project will call for two waterwheels to operate under a 200-ft. head, 400 cu.ft. per second flow, directly connected to alternators. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or its district offices, by referring to No. 119,489.

EXTENSIONS TO THE MUNICIPAL POWER PLANT AT JOHANNESBURG, SOUTH AFRICA. — Official sanction has been given, according to *Commerce Reports*, for the installation of a new 10,000-kw. turbo-generating unit at the municipal electric plant in Johannesburg. The Town Council will soon call for tenders for the new unit. The cost is estimated at about $50,000.

New Incorporations

THE HIDDENITE (N. C.) LIGHT & POWER COMPANY has been incorporated by David Adams and E. E. Lackey, Hiddenite. The company proposes to erect an electric transmission system.

THE CALUMET POWER COMPANY, Ltd., Gary, Ind., has been incorporated with a capital of 50,000 shares of no par value to generate electricity. The directors are Samuell Insull, Charles A. Munroe, Charles W. Chase, S. E. Mulholland and Morse Dellplain.

THE PAHOKEE (FLA.) UTILITIES COMPANY has been incorporated with a capital stock of $10,000 to manufacture and distribute electricity and ice. The officers are D. S. Spooner, president, and J. H. Cason, secretary and treasurer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BOSTON, MASS. — The committee on metropolitan affairs has submitted a report to the Massachusetts House of Representatives authorizing the Metropolitan District Commission to spend $250,000 for the installation of electric lamps on parkways and boulevards.

BROCKTON, MASS.—The Edison Electric Illuminating Company contemplates increasing its capital stock by $1,064,250, part of the proceeds to be used for extensions.

FALL RIVER, MASS. — The Durfee Mills, Inc., is building a power house on Pleasant Street, to cost about $50,000. The Henry R. Kent Company, 10 Erie Avenue, Rutherford, N. J., is architect and engineer.

LOWELL, MASS.—Plans have been submitted by the Lowell Electric Light Corporation for an ornamental lighting system on portions of Merrimack and Bridge Street. The Company has petitioned the Department of Public Utilities for an approval of an issue of 4,415 shares in capital stock, to be sold at $160 per share, the proceeds to be used to pay in part for additions and improvements already made and for proposed extensions.

Middle Atlantic States

AVON, N. Y.—The Livingston-Niagara Power Company has been authorized to extend its system to supply electricity in the towns of West Bloomfield and Richmond.

BROOKLYN, N. Y.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 4, for 85,000 glass-tube fuses for the local navy yard. (Schedule 1917.)

JAMESTOWN, N. Y.—Two 500-kw. automatic substations will be erected along the lines of the Jamestown, Westfield & Northwestern Railway and Chautauqua Traction Companies, one to be located at Stow and the other at Glen Ewen.

NEW YORK, N. Y.—Bids will be taken at once by the United States Navy purchasing office, South and Whitehall Streets, for one high-frequency apparatus, complete with rotary converter; one portable high-frequency machine, with rotary converter, and one ultra-violet light lamp. (M. & S. req. 116.)

PARMA, N. Y. — The Adams Basin (N. Y.) Electric Light & Power Company has been authorized to extend its system into the town of Parma. The company will serve electricity to the residents of the Hinckley Valley Road section.

SARANAC LAKE, N. Y. — The Paul Smith Electric Light & Power & Railroad Company has acquired a site at Racquette Falls, near Axton, on which it proposes to build a power development.

SYRACUSE, N. Y.—The Syracuse Lighting Company contemplates extending its transmission lines to the southeastern section of Oswego County to furnish electricity in the towns of Cleveland, Constantia, West Monroe and other communities in that section. It is also proposed to extend the lines to cottages on Oneida Lake not already supplied with electricity.

CAMDEN, N. J.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until March 11, for four electric annealing furnaces for the Camden and Fore River (Mass.) navy yards (Schedule 1914); also, for two electric melting furnaces (Schedule 1921.)

LINDENWOLD, N. J.—The Commissioners of Lindenwold have contracted with the New Jersey Electric Company to install an electric lighting system here.

LIVINGSTON, N. J.—Plans are being considered for the installation of street-lighting systems here.

ORANGE, N. J.—The City Commission is considering extensions to the municipal electric plant, including the installation of a turbo-generator and auxiliary equipment.

POMPTON LAKES, N. J.—The Central Jersey Power & Light Company has acquired the property of the Tri-County Electric Company and will consolidate with its system. Extensions will be made in the transmission system.

WHITING, N. J.—The Bamberg Lake Corporation, recently formed to develop a local industrial city, plans to install a substation for light and power service.

BLOSSBURG, PA. — The North Penn Electric Company has applied for permission to erect transmission lines in different portions of Bradford County.

LANGHORNE, PA. — The Philadelphia Suburban Gas & Electric Company has acquired the plant of the Langhorne Electric Light & Power Company and will consolidate with its system. Extensions will be made to the transmission lines.

PITTSBURGH, PA. — The West Penn Power Company has applied for permission to erect additional transmission lines across the Monongahela River.

WILLIAMSPORT, PA.—The Old Lycoming Power & Light Company, now being organized as a subsidiary of the Pennsylvania Power & Light Company, plans to erect a transmission system in Old Lycoming Township for light and power service.

BALTIMORE, MD. — Extension of the North Avenue ornamental lighting system from St. Paul Street east to Gay Street and Belair Road and west from McMechen Street to Monroe Street is under consideration by William A. Parr, Commissioner of Lamps and Lighting.

YORKTOWN, VA.—Work has started on the foundations of the proposed hotel (Yorktown Manor), to cost about $2,000,000. The main building will cost about $1,000,000 and the auxiliary buildings, including power house, another $1,000,000.

WASHINGTON, D. C.—Bids will be received by the chief of air service, United States Army, until March 4, for 350 type AS-2 aircraft storage batteries. (Circular CAS 24-88.)

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until March 11, for seventy-five radio-frequency transformers, fifty transformer mounting hangers and 100 transformer mounting supports. (Proposal C. P. 15891-B-13.)

North Central States

JACKSON, MICH.—Bids will be received by the city clerk until March 12, for one motor-driven centrifugal pumping unit complete with electric control apparatus. The capacity of the pump will be 7,000 gal. per minute against a head of 35 ft.

PETOSKEY, MICH.—Extensions and improvements to the municipal electric plant are reported to be under consideration.

CLEVELAND, OHIO.—Steps have been taken by the Superior Avenue Association for the installation of an ornamental system on that thoroughfare.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, Room 227, City Hall, for furnishing to the various departments of the city, board of education and public library all the tungsten lamps required for a period of one year. The cost is estimated at about $50,000.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, Room 227, City Hall, until March 6, for furnishing X-ray material for the new children's tuberculosis sanatorium, Warrensville.

NORWOOD, OHIO.—The City Council is considering the installation of an ornamental lighting system on Main Avenue.

READING, OHIO.—The General Match Company, Cincinnati, plans to build a power house at its local plant, to cost about $250,000.

WILLARD, OHIO.—The Board of Public Affairs has engaged the Froelick & Emery Engineering Company to make investigations in connection with extensions to the municipal electric plant. The cost is estimated at from $100,000 to $125,000.

YOUNGSTOWN, OHIO. — The Youngstown Sheet & Tube Company plans to equip the skelp mill at its steel works at East Youngstown and its skelp mill at the Chicago works for electrical operation.

LOUISVILLE, KY. — Permission has been granted to the Kentucky Utilities Company and the Kentucky Hydro-Electric Company to erect and operate transmission lines in portions of Boyle County.

INDIANAPOLIS, IND. — The Terre Haute, Indianapolis & Eastern Traction Company has been granted permission to erect a transmission line on several streets in the city.

SHELBYVILLE, IND. — The Flatrock Hydro-Electric Company has applied to the Public Service Commission for permission to issue $50,000 in capital stock, the proceeds to be used for the construction of a hydro-electric plant on Flatrock River, about 8 miles south of Shelbyville. C. C. Shipp, Indianapolis, is president.

VINCENNES, IND.—The Indiana Power Company plans extensions to its transmission lines in the Wabash River Valley, to cost about $25,000.

CHARLESTON, ILL.—Plans are under consideration to build a power house, to cost about $100,000, at the Teachers' State Normal School. C. H. Miller, Capitol Building, Springfield, is director of public works.

BLACK RIVER FALLS, WIS.—Bids will be received until March 17 for a water-well system to produce from 300,000 gal. to 500,000 gal. daily, equipped with motor-driven pumps, auto starter, etc. W. G. Kerchoffer, Madison.

BOSCOBEL, WIS.—The City Council is considering building a municipal electric light plant or securing service from a private corporation organized by local residents. The contract with the Interstate Light & Power Company, Madison, for supplying electricity for the municipal electric system expires in April, and unless better terms can be obtained the contract will not be renewed.

COLUMBUS, WIS.—The Council is considering the installation of an ornamental lighting system on Broadway in the downtown section.

CRIVITZ, WIS. — Arrangements have been made by the Village Board and the Wisconsin Public Service Corporation, Green Bay, whereby the latter will erect a transmission line from its hydro-electric plant at Johnson Falls to Crivitz (16 miles) to supply electricity in Crivitz, which will be distributed by a local distribution system to be installed here.

FRIENDSHIP, WIS. — The Friendship Light & Power Company has acquired a site on the Big Rouche-à-Cris Creek, near Preston, on which it proposes to build a hydro-electric plant.

JEFFERSON, WIS.—The Board of Light and Water Commissioners have submitted recommendations to the City Council for extensions and improvements to the electric generating units, etc., to cost between $2,000 and $3,000. The Wisconsin Gas & Electric Company now furnishes electricity to operate the local system from its Watertown station.

LA CROSSE, WIS. — The Wisconsin-Minnesota Light & Power Company has submitted a proposal to the City Council providing for replacing the present steam pumping equipment with electrically operated pumps, to cost about $20,000. The plans call for the installation of two electrically operated pumps.

MANITOWOC, WIS.—The Public Utility Commission is considering extending an electric transmission line to serve residents outside of the city limits beyond Michigan Avenue.

MERRILL, WIS.—The Council is considering replacing the present ornament lamps with a permanent ornamental lighting system in the downtown section of the city.

MILWAUKEE, WIS. — Funds to the amount of $150,000 have been provided in the 1924 budget of the city for the proposed extensions to the street-lighting system in various parts of the city, plans for which are being prepared by the Municipal Bureau of Street Illumination.

SHOREWOOD, WIS.—The Village Board has given its approval of an expenditure of $100,000 for various municipal improvement, including extensions and improvements to the street-lighting system.

WAUSAU, WIS.—The Wisconsin Valley Electric Company has been granted permission to issue $500,000 in bonds, part of the proceeds to be used for extensions and improvements.

BEMIDJI, MINN.—The City Council is reported to be considering installing a municipal electric plant.

BRAINERD, MINN. — The Water and Light Department is considering extensions and improvements to the street-lighting system.

RIVERTON, MINN. — The Minnesota Power & Light Company, it is reported, plans to erect a local substation to step down the 110,000-volt service from Nashwauk to 33,000 volts for distribution in the mining section, Cuyuna Range district.

CLARKSDALE, MO.—The citizens have voted to accept the proposal of the North Missouri Power Company for electrical service. A transmission line will be erected from the Maysville-Plattsburg line.

COFFEY, MO. — The proposal of the North Missouri Power Company to supply electrical service here has been approved by the voters. A transmission line will be erected from Pattonsburg to Coffey.

INDEPENDENCE, MO. — The Jackson County Light, Heat & Power Company, it is reported, contemplates extensions in its lines, to cost about $50,000.

KANSAS CITY, MO.—During the coming year the Kansas City Power & Light Company plans to build a new automatic substation and extension to a hand-operated substation, which will be remodeled for automatic operation.

ST. LOUIS, MO.—A bill calling for $250,000 for extension of the public lighting systems during the fiscal year has been presented to the bond supervisors by J. A. Hooke, Director of Public Utilities.

UNIVERSITY CITY, MO.—The Terrell Croft Engineering Company, 6,600 Delmar Avenue, St. Louis, has been retained by Ferrand and Fitch, architects, Washington University, St. Louis, to supervise the electric, heating and ventilating installation for the new grade school in Creveling Tract. The cost is estimated at about $100,000.

OMAHA, NEB. — Extensions and improvements are contemplated by the Nebraska Power Company to its plant in Omaha, to cost about $3,250,000. The company has applied to the Street Railway Commission for permission to issue $1,200,000 in capital stock, the remainder of the expenditure will be provided for by a bond issue already provided for.

Southern States

ASHEVILLE, N. C.—The erection of a power plant and lake to cost about $75,000, is under consideration by the City Commission.

CHIMNEY ROCK, N. C.—The Chimney Rock Mountains, Inc., recently formed to develop a local mountain resort, plans to construct a hydro-electric plant on the Rocky Broad River to develop 2,000 hp. E. S. Draper, Charlotte, is architect and engineer.

WAXHAW, N. C.—Arrangements are being made for the installation of a municipal electric system here. A transmission line will be erected from Waxhaw to Monroe, where it will connect with the system of the Southern Power Company. The town will build the line and install the local substation and distribution system. Harry Bloxam, Salisbury, is engineer in charge of the installation.

GREENVILLE, S. C.—The trustees of the South Carolina State College of Agriculture and Engineering are planning to build a power plant and enlarge the textile building. The new plant will supply power for heating the college buildings as well as electricity for light and power purposes. The power plant will also be a testing laboratory for the engineering students and will be equipped with the latest steam and electrical testing apparatus.

MACON, GA.—The Central of Georgia Public Service Company, recently formed as a subsidiary of the Central Georgia Power Company, has acquired a site near Macon for a steam-operated generating plant, to consist of five units, each of 13,000 hp. capacity, to cost about $2,000,000. The station will be operated by the Central Georgia Company, which plans to build a local substation and extend its transmission system at a cost of about $300,000.

SANFORD, FLA.—Bids will be received by W. B. Williams, city manager, until March 10, for electrically operated pumping machinery, etc., for the municipal waterworks. Joseph E. Craig, 427 King Street, Jacksonville, is engineer.

CHATTANOOGA, TENN.—Bids will be received by the Central Business Men's League until March 5 for the installation of a new ornamental lighting system on Main Street.

LAWRENCEBURG, TENN.—A special election will be held on April 14 to vote on the proposal to issue bonds for the construction of a municipal hydro-electric plant.

ORLINDA, TENN.—The Public Service Commission has granted the Davidson Light & Power Company, Springfield, permission to take over the local electric plant and to extend its service into Robertson County.

GULFPORT, MISS.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until March 30 for the installation of an automatic telephone system at the local United States veterans' hospital.

HATTIESBURG, MISS.—Steps have been taken by the Exchange Club for the installation of an ornamental lighting system.

HUNTSVILLE, ALA. — The Alabama Power Company contemplates the erection of a high-tension transmission line from Huntsville to Sheffield.

MOBILE, ALA.—The City Commission is considering the installation of an ornamental street-lighting system in the business district.

ASHDOWN, ARK.—W. L. Moody, Little Rock, has taken over the local electric plant and ice-manufacturing plant of the Commonwealth Public Service Company and plans extensions.

LITTLE ROCK, ARK. — Arrangements are being made by the Arkansas Brick & Tile Company for rebuilding its local plant recently destroyed by fire. The works will include a steam power house and other buildings, machine department, etc.

SHREVEPORT, LA. — Extensions and improvements, to cost about $1,500,000, during the present year are under consideration by the Southwestern Gas & Electric Company.

McALESTER, OKLA.—The properties of the Choctaw Power & Light Company and the Pittsburg County Railway Company have been acquired by Albert Emanuel Company, Inc., 61 Broadway, New York City. The systems will be consolidated with the Coal District Power Company, Huntington, Ark.

WAYNOKA, OKLA. — Bonds to the amount of $28,000 have been voted for extensions to the municipal electric plant, including a 200-hp. oil-engine-driven generating unit, motor-driven pumps, etc.

AUSTIN, TEX. — The State Board of Water Engineers has announced that options on all water rights on the Guadalupe River from Kendal through Gonzales County have been taken over by C. W. Besancor and F. H. Wilmot of New Orleans. The project includes the construction of thirteen dams and the development of from 75,000 hp. to 100,000 hp.

BEAUMONT, TEX. — Plans are being prepared by the Neches Company for the installation of an electric lighting system on Beaumont-Port Arthur highway, to cost about $40,000. P. E. McChesney is engineer.

COLLINSVILLE, TEX.—The City Council is considering calling an election to vote on the proposal to issue $10,000 in bonds for the construction of a municipal electric plant.

EL PASO, TEX.—Plans for the proposed factory for the El Paso Cotton Mill Company include a power plant. The M. H. Merrill Company, 50 State Street, Boston, is engineer.

FORT WORTH, TEX.—Plans have been completed for the installation of an ornamental lighting system in the Cheltenham section.

SOUR LAKE, TEX.—The installation of an electrci light and power plant, to cost about $75,000, is under consideration. W. E. Lee and N. M. Morrison are among the directors.

Pacific and Mountain States

SEATTLE, WASH. — The Puget Sound Pulp & Paper Company plans to build a substation at its proposed mill, near the city, to cost about $5,000,000. Application has been made to the city for service from the municipal system.

SPOKANE, WASH.—Plans for the first unit of the proposed new factory to be built by the Home Sash & Manufacturing Company, to cost about $80,000, include a power house.

ANTIOCH, CAL.—The Pacific Gas & Electric Company contemplates building a substation here, to cost about $150,000.

FRESNO, CAL.—Bids will soon be asked by the Fresno Traction Company for the construction of an automatic substation on Blackstone Avenue, near Dry Creek, to cost about $35,000.

FRESNO, CAL.—Plans are in progress for the installation of an ornamental lighting system on portions of Cherry Avenue, Mono, Ventura, Inyo, Los Angeles, G, H, and L Streets. William Stranahan is city engineer.

LODI, CAL.—The Board of City Trustees is considering the installation of a fire-alarm system in the western section of the city.

LONG BEACH, CAL. — The Southern California Edison Company is considering the construction of a warehouse and apparatus distributing plant at Perris Road and Hill Street, to cost about $1,000,000.

LOS ANGELES, CAL.—Plans have been authorized by the City Council for the installation of an ornamental lighting system on South Park Avenue and on Beacon Street.

MARYSVILLE, CAL. — The Western Pacific Railroad Company is planning for the electrification of its local yards in connection with an improvement program to cost about $2,000,000.

PASADENA, CAL. — Plans are under way for the installation of an ornamental lighting system on Pasadena Avenue from Avenue 51 to Avenue 64.

REDWOOD CITY, CAL. — The Pacific Portland Cement Company, Pacific Building, San Francisco, plans to build a power house in connection with its proposed local mill, to cost about $1,000,000. W. C. Stevenson is engineer.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company is considering extending its transmission lines to Ramona, a distance of 6 miles.

SAN FRANCISCO, CAL. — The Pacific Gas & Electric Company has been granted a permit to take water from North Battle Creek, to develop about 2,700 hp.

SAN FRANCISCO, CAL. — The public utilities committee of the Board of Supervisors has recommended the appropriation of $800,000 from the Hetch Hetchy water bond fund for the construction of a step-down station to transform the energy developed at the Moccasin Creek power plant for distribution.

EMMETT, IDAHO.—An appropriation of $450,000 for the Black Canyon power plant, with the recommendation that the Gem Irrigation District be given first call on the power developed, has been placed in the reclamation budget and approved by the appropriations committee of the whole. The amount required for the power plant is estimated at $200,000, and $250,000 will be used to acquire and develop storage waters for the Black Canyon District.

CHEYENNE, WYO. — The Cheyenne Light, Fuel & Power Company plans extensions and improvements in its power plant to cost about $50,000.

CARLIN, NEV.—The Board of County Commissioners has authorized extensions in the municipal power plant, to include the installation of a 150-hp. Diesel-engine unit, switchboard, etc.

CLOVIS, N. M.—The installation of an ornamental lighting system on Main Street and Grand Avenue is under consideration.

SILVER CITY, N. M.—Preliminary plans are being prepared by the American Aluminum Corporation, 55 Liberty Street, for a hydro-electric plant on the Gila River in Silver City, to cost about $100,000.

Canada

NEW WESTMINSTER, B. C.—The British Columbia Electric Railway Company contemplates extensions to its local substation on Tenth Street, to cost about $40,000.

WINNIPEG, MAN.—Application has been made by B. W. Parker for a permit to install and operate an electrical heating system in the territory south of the Assiniboine River in Fort Rouge.

CHESTER, N. S.—The installation of an electric lighting system in Chester is under consideration.

COCHRANE, ONT.—Water rights have been acquired by Sutcliffe & Neelands, New Liskeard, on the Frederickhouse River, which, it is estimated, will develop 7,500 hp.

ESSEX, ONT. — The Hydro-Electric Power Commission of Ontario, Toronto, plans to erect a transmission line from Essex to Elmstead and to install two switches at the Essex transformer station, to cost about $50,000. E. R. Lawlor, 190 University Avenue, Toronto, is engineer.

FORT WILLIAM, ONT.—A bylaw has been approved authorizing an appropriation of $20,000 for extensions to the electric lighting system and $100,000 for additions to the telephone system.

HULL, QUE.—The Hull Electric Company contemplates a hydro-electric development at Paughan Falls, on the Gatineau River, in the township of Low, where 100,000 hp. will eventually be developed. W. J. Francis & Company, Montreal, are consulting engineers.

MONTREAL, QUE.—The Southern Canada Power Company has applied to the Public Service Commission for permission to erect a transmission line between Richelieu Village and St. John, a distance of 10 miles.

VERDUN, QUE. — The Montreal Light, Heat & Power Company plans to build a large hydro-electric plant at the city limits of Verdun and Ville La Salle, to cost about $2,000,000. R. M. Wilson is chief engineer.

Electrical Patents

Announced by U. S. Patent Office

(Issued Feb. 12, 1924)

1,483,470. EQUALIZING SPEEDS OF MOTOR DRIVES; A. J. F. Montabone, Montreal, Can. App. filed July 6, 1921. To obtain perfect regulation where a plurality of motors is used on one apparatus.

1,483,480. ELECTRIC FURNACE CONTROL SYSTEM; T. A. Reid, Wilkinsburg, Pa. App. filed April 18, 1922. For maintaining constant temperature.

1,483,489. SIGNALING SYSTEM FOR WARSHIPS; E. A. Sperry and E. Meitner, Brooklyn, N. Y. App. filed May 20, 1918. Gunfire control system.

1,483,518. TROLLEY SLEET CUTTER; C. T. Perry, Staten Island, N. Y. App. filed March 16, 1922.

1,483,532. WORKHOLDING APPARATUS; H. W. Tobey, Pittsfield, Mass. App. filed Nov. 17, 1922. To hold accurately so as to facilitate welding, etc.

1,483,533. PROTECTION OF TRANSMISSION LINES; O. C. Traver, Schenectady, N. Y. App. filed Feb. 23, 1921. For selective protection of feeders in parallel.

1,483,534. ELECTRIC WATER HEATER; G. H. Van Noy, Lewistown, Mont. App. filed Feb. 13, 1922. For domestic boilers.

1,483,536. AUTOMATIC REGULATOR; H. E. Warren, Ashland, Mass. App. filed Feb. 27, 1922. For speed-control systems.

1,483,538. LIGHTNING ARRESTER; C. T. Allcutt, Pittsburgh, Pa. App. filed May 6, 1919. Two electrodes of conducting material spaced by discharge block of conducting and non-conducting materials.

1,483,539. LIGHTNING ARRESTER; C. T. Allcutt, Pittsburgh, Pa. App. filed May 7, 1919. Two electrodes of conducting material spaced by discharge block.

1,483,540. LIGHTNING ARRESTER; C. T. Allcutt, Pittsburgh, Pa. App. filed May 12, 1919. Spark-gap electrodes.

1,483,548. LIGHTNING ARRESTER; F. A. Lind; Turtle Creek, Pa. App. filed May 6, 1919. "Multi-path" type.

1,483,552. PROTECTIVE MEANS FOR CONDENSER INSTALLATIONS; G. W. Pickard, Newton Center, Mass. App. filed Nov. 9, 1920. Where several condensers are used in series.

1,483,564. LIQUID-HEATING DEVICE; F. H. Wickes and C. H. Goodman, Roanoke, Va. App. filed Feb. 28, 1922. Portable type.

1,483,579. ELECTRICAL AMUSEMENT DEVICE; E. M. Goodwin, Cleveland, Ohio. App. filed May 29, 1922. To simulate the sport of fishing.

1,483,608, 1,483,609 and 1,483,610. CURRENT-COLLECTOR SUPPORT; E. S. Lincoln, Mansfield, Ohio. App. filed Sept. 30, 1921. For trolley poles, etc.

1,483,612. APPARATUS FOR WELDING AND METHOD OF OPERATING THE SAME; H. D. Morton, New York, N. Y. App. filed Nov. 17, 1922. Electric arc welding.

1,483,621. ART OF ELECTROTYPING; E. Voigt, Chicago, Ill. App. filed Feb. 19, 1923.

1,483,629. CURRENT REGULATOR; S. Ruttenberg and M. F. Leibowitz, New York, N.Y. App. filed July 13, 1922. For vacuum tubes.

1,483,642. SAFETY DEVICE FOR VACUUM TUBES; A. Mutscheller, New York, N. Y. App. filed July 17, 1919. As used in X-ray work.

1,483,655. DIRECTION INDICATOR; A. E. Faull, Oakland, Cal. App. filed Dec. 18, 1919. For automobile.

1,483,669. TELEGRAPHIC INSTRUMENT; W. S. Lytle, Philadelphia, Pa. App. filed July 16, 1921. For semi-automatic or manual use.

1,483,710. ELECTRICAL VARIED-LIGHT APPARATUS; G. L. Black, San Bernardino, Cal. App. filed April 30, 1919. For theatrical, advertising and amusement purposes, etc.

1,483,722. ART OF MAKING ELECTROLYTIC METAL AND APPARATUS THEREFOR; F. A. Eustis, Milton, Mass. App. filed June 13, 1922.

1,483,724. OFFICE INDICATOR; O. G. Gerner, Minneapolis, Minn. App. filed March 30, 1923.

1,483,726. AUTOMATIC NIGHT-LAMP FIXTURE; A. J. Heitz, Vincennes, Ind. App. filed May 31, 1922. Plural socket type.

1,483,783. ELECTRIC CLOCK; U. L. Collins, San Diego, Cal. App. filed Oct. 12, 1922. Self-winding.

1,483,790. METHOD AND SYSTEM FOR DETECTING SOURCES OF VIBRATION; G. D. Edwards, East Orange, N. J. App. filed Sept. 15, 1919. For detecting presence of submarine vessels.

1,483,796. MELTING OR SMELTING LOW-VOLATILE METAL; J. H. Gray, New York, N. Y. App. filed Aug. 20, 1920.

1,483,806. ELECTRICAL SCOREBOARD; C. A. Hendrix, Flora, Ind. App. filed Oct. 13, 1922.

1,483,814. ELECTRIC CLOCK; M. F. Juruick, Allentown, Pa. App. filed April 18, 1922. Pendulum type.

1,483,820. AUTOMATIC TIME CLOCK; H. G. Lundgren, Oakland, Cal. App. filed May 8, 1922.

1,483,837. ELECTRIC COOKER; E. Scott, Westmoreland, Kan. App. filed Sept. 11, 1922. With removable elements for use with various voltages.

1,483,860. ANTENNA ARRANGEMENT FOR WIRELESS TELEGRAPHY; O. von Brook, Berlin, Germany. App. filed Sept. 3, 1921. To reduce energy consumed in the mast of an aërial.

(Issued February 19, 1924)

15,774 (reissue). TELEPHONE SYSTEM WITH AUTOMATIC RINGING DISCONNECT; F. Schoenwolf, Chicago, Ill. App. filed Nov. 27, 1914.

1,483,885. ELECTROLYTE; C. O. Hoen, St. Paul, Minn. App. filed June 8, 1922. For storage batteries.

1,483,900. TELEPHONE-EXCHANGE SYSTEM; A. E. Lundell, New York, N. Y. App. filed Aug. 23, 1919. For automatic or semi-automatic exchanges.

1,483,922. OIL-INSULATED TRANSFORMER; C. D. Ainsworth, Wollaston, Mass. App. filed March 17, 1919. Current transformers for high-potential circuits.

1,483,930. TRANSMISSION - EQUALIZATION ARRANGEMENT; L. H. Darrow, Brooklyn, N. Y. App. filed Dec. 23, 1920. For telephone systems.

1,483,956. TELEPHONE SYSTEM; J. F. Toomey, New York, N. Y. App. filed Nov. 8, 1921. To simplify establishing connections between telephone lines.

1,484,041. ELECTRIC CLOCK-SETTING MEANS; F. J. Seabolt, Schenectady, N. Y. App. filed March 22, 1916. Automatic resetting from a remote point.

1,484,046. STARTING SWITCH; C. H. Wellington, Ventura, Cal. App. filed April 5, 1923. For single-phase induction motor.

1,484,051. INSULATOR; A. O. Austin, Barberton, Ohio. App. filed April 10, 1919. Improved mechanical construction.

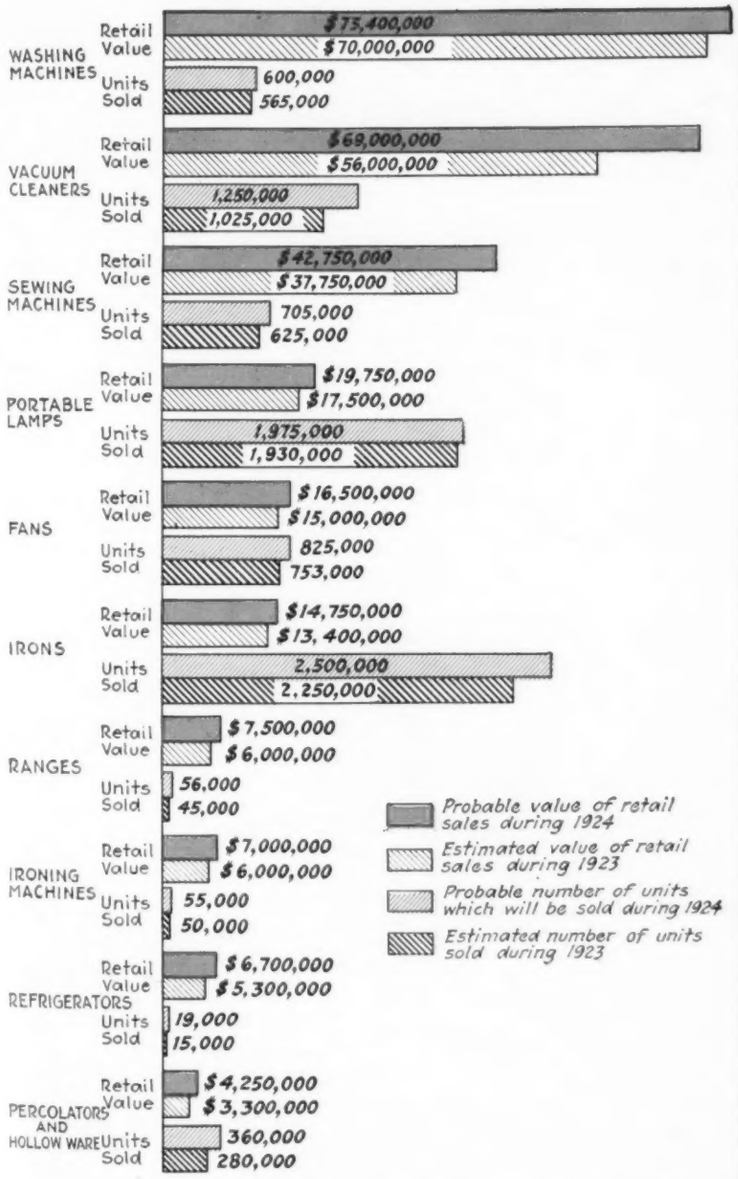
1,484,087. RADIO BROADCASTING EQUIPMENT; F. M. Ryan, East Orange, N. J. App. filed Aug. 14, 1922. Control and signal circuits.

1,484,090. ROTARY MAGNETIC CHUCK; F. L. Simmons, Woonsocket, R. I. App. filed April 11, 1918.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Sales of Electrical Merchandise Supplies and Installation Service in 1923 Estimated at $2,003,745,000



Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote or use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

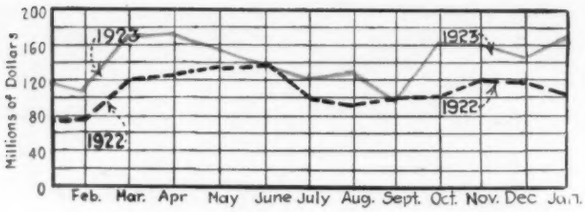
What Will Be Sold This Year

LAST year the light and power companies of America sold either to the public or to other utility systems 66,800,000,000 kilowatt-hours of electrical energy, for which they received approximately $1,300,000,000, a vast amount of money and an astounding sales total considering the youth of the electrical industry. During the same period, however, the sales of electrical merchandise, supplies and installation service, including labor, probably exceeded this amount by more than half a billion dollars; for these are estimated to have totaled not less than $2,003,745,000, according to an investigation made by *Electrical Merchandising*. And this amount is expected to increase by at least a quarter of a billion dollars more in 1924.

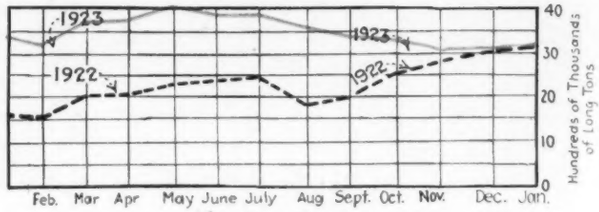
It is interesting to study the relative position of some of the more important elements that go to make up this great volume of electrical retail business, as shown on this chart. The tremendous size of this fixture business, for instance, is not generally appreciated, nor the extent of the sales of medicinal apparatus or electrical books and magazines. The total value of sales of electrical merchandise, appliances and supplies, with their cost of installation, is expected to amount to fully $18 per capita throughout the United States—from which any man can reckon what the electrical business in his own city should be. Energy sales, of course, are not included in this per capita sales figure.

The year just opening has every mark of being a banner one for all three branches of the electrical industry. It should be a year of record figures and stupendous accomplishments.

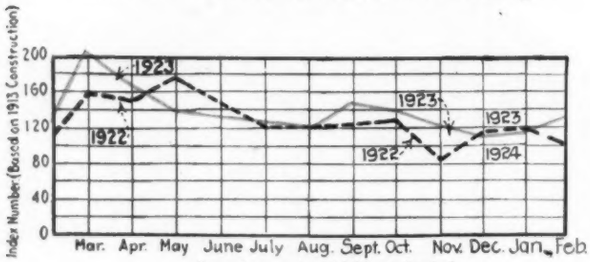
How the Primary Industries Are Trending



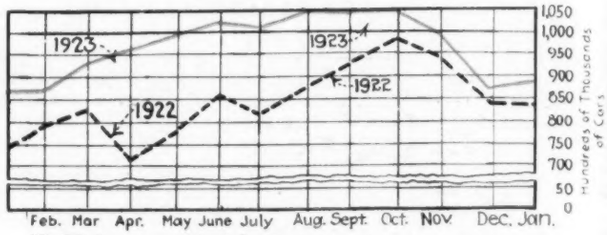
Contracts Awarded for Residential Buildings



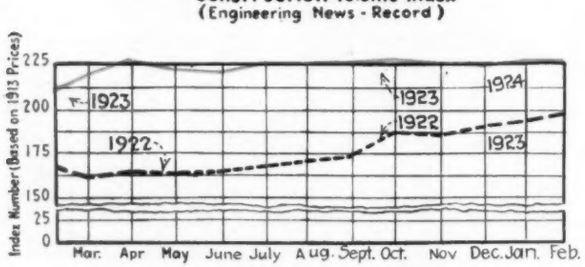
Pig-Iron Production



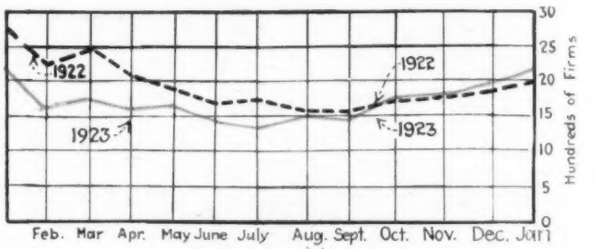
Construction Volume Index
(Engineering News-Record)



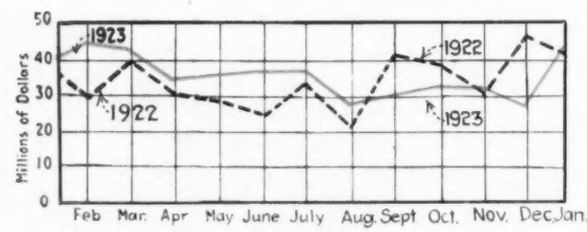
Total Average Weekly Freight-Car Loadings



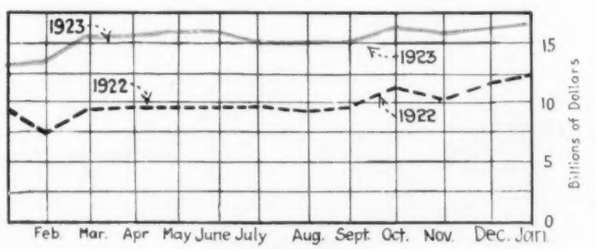
Construction Cost Index
(Engineering News-Record)



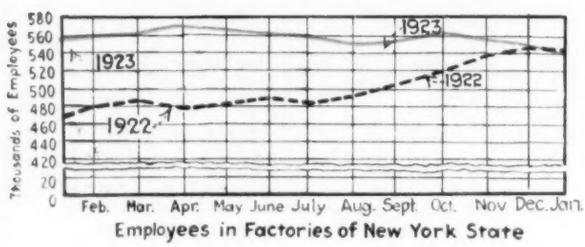
Business Failures



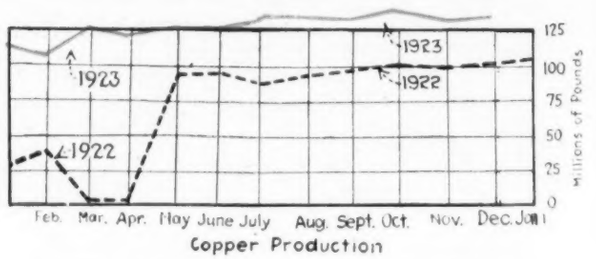
Fire Losses



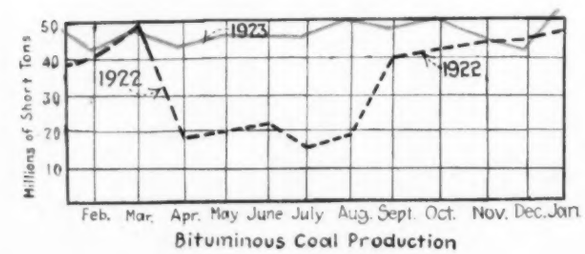
Bank Clearings
(Outside of New York City)



Employees in Factories of New York State



Copper Production



Bituminous Coal Production

Gradual Expansion in Business

DEVELOPMENTS during January confirm the generally expressed opinion that there will be a gradual expansion in business during the first half of the year. Car loadings took an upward swing after a material decrease during November and December. Activity in the iron and steel industry, a recognized barometer of national economic conditions, increased for the first time since May of last year. Supplies of money were unusually large for this season of the year.